Effects of agricultural cooperatives on members in developing countries: Studies on pricing and inclusion

D I S S E R T A T I O N
zur Erlangung des akademischen Grades

Doctor of Philosophy
(Ph.D.)

eingereicht an der
Lebenswissenschaftlichen Fakultät der Humboldt-Universität zu Berlin

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Tag der mündlichen Prüfung:
20. August 2019

I dedicate this thesis to Lena, for those unforgettable seventeen weeks and three days.

ZUSAMMENFASSUNG

Aus theoretischer und empirischer Sicht ist zu diskutieren, ob die Genossenschaften positive Auswirkungen für ihre Mitglieder haben. Unter den gegenwärtigen Bedingungen der ökonomischen Globalisierung und der modernen Agrarmärkte, die die Genossenschaften vor neue Herausforderungen stellen und gleichzeitig ein neues Interesse an deren Förderung als Entwicklungsinstrument wecken, ist ein besseres Verständnis und eine Analyse der Effekte von Genossenschaften im Kontext von Schwellen- und Entwicklungsländern erforderlich.

Das übergeordnete Forschungsziel dieser Dissertation ist die Erklärung und Bewertung der Auswirkungen, die landwirtschaftliche Genossenschaften auf ihre Mitglieder in diesen Kontexten haben. Die zwei Leitfragen lauten: (1) welches sind die sozioökonomischen Merkmale der Landwirte, die Mitglieder von Genossenschaften sind? und (2) welche spezifischen Auswirkungen haben landwirtschaftliche Genossenschaften auf ihre Mitglieder? Die erste Frage zielt darauf ab, ob ärmere oder benachteiligte Landwirte tatsächlich Mitglieder von Genossenschaften sind, während die zweite Frage untersucht, welche Vorteile Genossenschaften ihren Mitgliedern bieten. Die Fragen werden in einer systematischen Literaturarbeit und drei empirischen Artikeln behandelt, die sich mit den spezifischen Auswirkungen von Genossenschaften auf Preise und Inklusion befassen.

Die systematische Literaturrecherche (erster Artikel) zeigt, dass das, welches beruhend auf den untersuchten Artikeln über Genossenschaften bekannt ist, auf einer sehr begrenzten Anzahl von Fällen beruht, da viele Artikel hinsichtlich des Veröffentlichungsdatums, der geografischen Standorte und der untersuchten landwirtschaftlichen Sektoren stark konzentriert sind. Bezüglich der Eigenschaften von Mitgliedern und Nichtmitgliedern kann die These, dass wohlhabendere Landwirte mit größerer Wahrscheinlichkeit Genossenschaftsmitglieder sind, nicht schlüssig belegt werden. Die deutlichsten empirischen Belege für positive Effekte von Genossenschaften finden sich in den Kategorien ‚Zugang zu und Nutzung von landwirtschaftlichen Betriebsmitteln', ‚Einkommen', ‚Preise' sowie ‚Status und Entscheidungsmacht von Frauen'. Unabhängig von den Wirkungskategorien gibt es einen relevanten Anteil an Ergebnissen, für die nicht genügend Belege vorliegen, um sie abschließend zu bewerten. Positive Effekte sind daher wahrscheinlich, müssen jedoch weiterhin bestätigt werden.

Im zweiten und dritten Artikel werden die Eigenschaften der Mitglieder und Preiswirkungen von Genossenschaften und anlegerorientierten Unternehmen im argentinischen Wein- und Milchsektor untersucht. Landwirte, die an Genossenschaften verkaufen, erhalten in den untersuchten Fällen niedrigere Preise für ihre Produkte als Landwirte, die an anlegerorientierte Unternehmen verkaufen. Da Genossenschaftsmitglieder sich hinsichtlich Größe, Vermögen und Kosten des Marktzugangs von anderen Landwirten unterscheiden, lässt sich sagen, dass Genossenschaften mit diesen benachteiligten Landwirten handeln und dafür niedrigere Preisen zahlen. Dennoch bieten Genossenschaften andere Vorteile wie politische Repräsentanz und unbegrenzte Lieferrechte, die die Landwirte für die niedrigeren Preise kompensieren können.

Das vierte Papier analysiert Mechanismen, die zur Inklusion benachteiligter Haushalte in sambischen Maisgenossenschaften beitragen. Inklusion entwickelt sich in Genossenschaften, die Engagement zeigen und entweder vulnerable Mitglieder mit Finanzdienstleistungen versorgen, soziale Identität fördern oder benachteiligte Mitglieder dafür entschädigen, dass sie keinen Zugang zu subventionierten Betriebsmitteln haben.

Die Gesamtergebnisse zeigen, dass Genossenschaften im Allgemeinen mit den am stärksten benachteiligten Landwirten zusammenarbeiten. Sie erzielen verschiedene positive Wirkungen für ihre Mitglieder. Dennoch gibt es auch einen relevanten Anteil von Fällen, in denen es nicht genügend empirische Belege für ihre Auswirkungen gibt. Deswegen sollten Regierungen und Geber optimistisch, aber vorsichtig auf die Eignung und Wirksamkeit von Genossenschaften zur Erreichung bestimmter Ziele blicken. Da es einen Publikationsbias geben kann, können negative Auswirkungen, obwohl selten veröffentlicht, nicht ausgeschlossen werden.

Basierend auf meinen empirischen Untersuchungen schlage ich erstens vor, dass Genossenschaften als Organisationen mit vielfältigen Funktionen und Wirkungen entsprechend dieser Komplexität und Vielfalt bewertet werden sollten und nicht nur durch die Analyse einzelner Auswirkungen. Zweitens sollte die Genossenschaft anhand der besonderen Charakteristika ihrer Mitglieder beurteilt werden. Dies bedeutet, dass ihre Effekte möglicherweise die Bedürfnisse oder Eigenschaften der Mitglieder und nicht die organisatorischen Merkmale an sich widerspiegeln.

ABSTRACT

From both theoretical and empirical perspectives, whether cooperatives provide their members with benefits remains open to debate. Under the present conditions of economic globalisation and modern agricultural markets, which are simultaneously imposing new challenges on cooperatives as well as prompting renewed interest in promoting them as a development tool, better understanding and analysis of cooperative effects in developing contexts is needed.

The overarching research objective of this thesis is to explain and assess the effects agricultural cooperatives have on their members in developing contexts. The two guiding questions are: (1) what are the socio-economic characteristics of farmers who participate in cooperatives? and (2) what are the specific effects of agricultural cooperatives on their farmer members? The first question examines whether the poorer or more disadvantaged farmers actually participate in cooperatives, whereas the second question analyses what kinds of benefits cooperatives provide. The questions are addressed in a systematic literature review and three empirical papers focusing on the specific cooperative effects on prices and inclusion.

The systematic literature review (Paper One) finds that what is known about cooperatives through the articles examined is based upon a very limited set of cases, since many of the articles are highly concentrated in terms of publication date, geographical locations and agricultural sectors investigated. Regarding member and non-member characteristics, the empirical evidence concerning claims that better-off farmers are more likely to be members appears to remain inconclusive. The most conclusive evidence of positive effects corresponds to the categories access to and use of inputs, income, prices and women's status and agency. Regardless of the effect categories, there is a meaningful share of results for which there is not enough evidence of effects; therefore, positive effects are probable, but they have to be further confirmed.

The Paper Two and Three explore member characteristics and price effects of cooperatives and Investor-Oriented Firms in the Argentinean non-varietal wine and dairy sector, respectively. Farmers selling to cooperatives receive lower prices than farmers selling to Investor-Oriented Firms in the studied cases. Since cooperative members differ from other farmers in terms of size, assets and the cost of accessing the market, it can be concluded that cooperatives deal with more disadvantaged farmers at the expense of lower prices. Nevertheless, cooperatives offer

other benefits such as political representation and unlimited delivery rights, which may compensate farmers for lower prices.

The Paper Four analyses the mechanisms that contribute towards inclusion of disadvantaged households in Zambian maize cooperatives. Inclusion develops in cooperatives that show commitment and either provide financial services to vulnerable members, promote social identities or compensate disadvantaged members for not being able to access subsidised inputs.

The overall results show that cooperatives generally work with the most disadvantaged farmers. They create multiple positive effects for their members. However, there is also a meaningful share of cases with a lack of sufficient evidence of effects. Therefore, governments and donors should remain optimistic but cautious about the suitability and efficacy of cooperatives in all cases. Since there can be a publication bias, negative effects, though rarely reported, cannot be ruled out.

Based on my empirical research, I suggest that, first, cooperatives, as organisations with multiple functions and effects, should be assessed according to that complexity and variety and not by analysing each effect isolated. Second, cooperatives should be assessed in the light of the particularities of their farmer members, meaning that their effects may reflect farmer needs or characteristics and not organisational features per se.

ACKNOWLEDGEMENTS

The end of this thesis finds me in a delicate personal moment, in which reviewing the sources of joy of the past years gives me strength and feels good and necessary.

Initially, I would like to thank the National Institute of Agricultural Technology in Argentina for funding my doctoral studies, but most of all, for being the work place where I could bring all the energy and passion that comes with the first job. My seven years there are life-long memories. Special thanks go to José Luis Melendez, Gabriel Delgado and Héctor Espina.

I would like to thank my supervisor Prof. Dr. Markus Hanisch for his constant support. He has always encouraged my research and motivated me in difficult times. I am especially thankful for all his advice and availability regarding personal matters, which considerably helped me finishing my studies. Furthermore, I am grateful to my co-supervisor Prof. Dr. Cynthia Lynn Giagnocavo for taking her valuable time to examine this work.

My co-authors have enabled and enriched this learning process, besides rescuing me from moments of despair. I owe special thanks to all of you: Prof. Dr. Murray Fulton, Dr. Jens Rommel, Margitta Minah, Carla Dohmwirth, María Soledad Puechagut and Laura Gastaldi.

A special mention goes to all the people in Argentina and Zambia who accepted to be interviewed and kindly shared their thoughts and experience, gave me additional materials and support to continue the research. They have provided meaning to my work.

I am also grateful for a great work environment. I have received challenging comments and warm support from Aicha Mechri, Anke Wolf, Carla Dohmwirth, Katrin Martens, Dr. Julian Sagebiel, Malte Müller, Margitta Minah, Marleen Thürling and Dr. Ziming Liu. It has always fascinated me to learn from our different perspectives. Reinhold Wilhelm, Renate Judis and Susan Pocai have provided kind support with organisational matters. Christopher Hank has provided me with so much more than proof reading. He has amazed me with his care for words and details, giving me the pleasure of admiring the beauty of mastering a language.

Last but not least, family and friends have encouraged me in multiple ways, from messages and talks to warm welcomes with massive *asados*. Those memories kept me warm in the long dark winters of the thesis. The love of my mum, my brothers, sisters-in-law and nephews pushes me

further in life. Last, the greatest thanks of all to Chris, for being my German-latin, capable of combining all our differences for our best.

LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
BIC	Bayesian Information Criterion
CV	Coefficient of Variation
FeCoVitA	Argentinean Federation of Wine Making Cooperatives
FISP	Farmer Input Support Programme
FO	Farmer organisations
fsQCA	fuzzy-set Qualitative Comparative Analysis
GDP	Gross Domestic Product
ICA	International Cooperative Alliance
ICC	Intra Class Correlation
INTA	National Institute of Agricultural Technology
IOFs	Investor-Oriented Firms
ML	Multilevel
NGOs	Non-Governmental Organisations
OLS	Ordinary Least Squares
QCA	Qualitative Comparative Analysis
RoN	Relevance of Necessity

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1 INTRODUCTION

1.1 Problem statement

Historically, agricultural cooperatives have been born out of adverse economic circumstances (Sargent, 1982) and various schools of thought explain their existence as a means for achieving economic growth and development. From a neoclassical perspective, cooperatives may help to counter the negative effects of market failure (Cook, 1995). They may also compensate for missing market institutions or limited competition by preventing opportunism and holdup situations (Cook and Iliopoulos, 1999). In imbalanced markets, they may enable farmers to pool produce and exercise countervailing power (Hendrikse and Bijman, 2002; Sykuta and Cook, 2001) and, thereby, improve producer prices and overall market efficiency (Cotterill, 1987; Nourse, 1945)

Apart from overcoming market failure, studies from new institutional economics highlight how cooperatives may help to reduce transaction costs related to gathering and processing information needed for carrying out transactions, reaching decisions, signing contracts and enforcing them (Staatz, 1987). Finally, during times of rapid structural change, cooperatives may become buyers of last resort for otherwise disconnected small- and medium-scale farmers and can, thus, be understood as a means for trying to insure farmers against the hardships of structural change (Nilsson et al., 2016).

In addition, there are socio-political reasons for the existence of cooperatives. From a policy perspective, the dispersion and remoteness of farmers may exclude them from obtaining proper political representation (Borda-Rodriguez et al., 2016; Staatz, 1987; World Bank, 2008) or benefitting from instruments of public policy, such as farm credit subsidies and development projects. Therefore, cooperatives can fulfil the function of better linking farmers to political spheres (Landini et al., 2017). Lastly, cooperatives may also support channelling of the social needs of farmers for participation, integration and community development, especially in otherwise marginalised rural areas (Centner, 1988; Christy, 1987).

Despite these relatively commonly held views, the literature also provides a variety of arguments seeking to explain why cooperatives can be less economically efficient than Investor-Oriented Firms (IOFs). Property rights and agency theory proponents indicate that the vaguely defined property rights of members in the realm of the cooperative may lead to conflicts over

residual claims and decision control, leading to economic inefficiencies (Nilsson, 2001). Moreover, cooperatives can follow multiple and even quite different objectives – from self-help and grassroots participation to economies of scale and social control over resources (Lele, 1981) – and be prone to rent-seeking behaviour (Banerjee et al., 2001), which may also be detrimental to their economic efficiency. From a governance perspective, cooperatives can experience human capital problems, since the democratic model underlying cooperative decision making assures that any members can be elected for the board, even though they may not bring along the necessary expertise for the position (Cornforth, 2004).

In developing and transition countries, governmental interference has affected cooperative performance. Since the 1950s, most developing-country governments have conceived of and supported the cooperative as a tool for delivering economic growth (Vicari, 2014) and development (Coque Martínez, 2002) as well as a means for creating political support in rural areas and attenuating potential social unrest or revolutionary aspirations (Mora, 2012). Cooperatives have, consequently, been subject to political and ideological influence. For instance, in socialist countries, cooperatives became instruments seeking to establish a socialist, collectivised and centralised mode of agricultural production (Holmén, 1990). As extensions of the state, cooperatives were not necessarily aimed at improving their members' collective interests (Okem and Stanton, 2016). Consequently, many of them ended up becoming corrupt and inefficient.

Beside such political reasons, lack of infrastructure, and physical and human capital as well as elite capture may impede the progress of cooperatives (Braverman et al., 1991). Entrenched leadership dominated by a few members – generally the better-off or community leaders – during long periods of time may orient cooperative benefit streams towards those few members and lead to absence of vigorous monitoring of their actions (Tendler, 1983).

Although in 2014 there were more than one million agricultural cooperatives worldwide, with around 120 million beneficiaries (United Nations, 2014a), cooperative effects on economic growth and development remains contested. From an empirical perspective, many of the positively evaluated examples are located in developed countries. Even though cooperative data at the global level is scarce, the 2014 Global Census of Cooperatives did manage to collect data from 145 countries (United Nations, 2014a). Three ratios were used for that census to assess the vitality of the cooperative sector at the country level: cooperative membership penetration relative to the population, cooperative employment relative to the population and annual gross

revenue or turnover of all cooperatives relative to the respective country's Gross Domestic Product (GDP). Yet only developed countries made up each ratio's top-ten ranking (United Nations, 2014b). As Wanyama et al. (2009) suggest for Africa, for developing countries the list of unsuccessful examples may, in the best-case scenario, be just as long as the list of successful ones.

In addition, economic globalisation presents new challenges to cooperative performance. Economic globalisation, as a process that fosters regional economic integration, exposes the national productive structure to foreign competition due to the flexibility and mobility of capital (Dicken, 2011). In order to remain competitive, cooperatives may increase their size in domestic or international markets to an extent that may not be compatible with their principles and values, leading, for instance, to a decrease in member involvement in decision making (Bretos and Marcuello, 2017).

Economic globalisation also transforms agricultural markets. Sexton (2013) highlights three distinctive characteristics of modern agricultural markets. First, from a supply perspective, there is an increasing concentration in the number of firms in each step of the value chain: input provision (Fuglie et al., 2011), manufacturing or processing (Ollinger et al., 2005) and retailing (McCorriston, 2002). Second, from a demand perspective, consumers, due to increasing disposable income for food consumption and health concerns, have higher expectations regarding product quality and differentiation (Saitone and Sexton, 2010). Third, to fulfil consumer expectations and avoid uncertainties associated with agricultural production, such as unstable production volumes, processors and farmers are increasingly using agricultural contracts (Goodhue, 2011). Since most agricultural marketing cooperatives provide members unrestricted delivery rights in terms of quantity and quality, they can have difficulties in meeting downstream buyer needs and, therefore, performing in such modern agricultural markets (Mérel et al., 2009).

The effects of economic globalisation and its associated updating of agricultural markets, though more evident in developed countries, are increasingly present in developing countries in which liberalisation processes have triggered structural changes. Since the 1980s, many developing countries have undergone processes of structural adjustment that have deregulated and liberalised agricultural markets by reducing state intervention or support such as subsidies, commercialisation boards and external trade restrictions. As a consequence, cooperatives that were inefficient or highly dependent on state intervention collapsed (Vicari, 2014). Since the

1990s, within a context of increasing scale of production and competition among processors, and introduction of new technologies, cooperatives have been struggling to implement bottom-up models, hoping to enhance farmer participation and commitment to overcome their negative past experiences with cooperatives.

Since this globalised and changing context can be particularly hard for small farmers, in recent decades a renewed interest in promoting cooperatives for rural development has arisen among governments and donors. Due to their size, small farmers are disadvantaged compared to larger farmers in terms of their ability to reach economies of scale, exercise bargaining power, and gain access to capital, markets, information and infrastructure (Trebbin and Hassler, 2012). Governments have enacted new cooperative laws to confirm their status as independent, autonomous, and member-owned businesses (Birchall, 2003). They are also supportive of cooperatives as core elements of national policy agendas for poverty reduction and more inclusive rural development (Francesconi and Heerink, 2011). Donors see cooperatives as potential partners when other players, such as public services providers, are absent (Mercoiret et al., 2001). Meanwhile, some international organisations, such as the United Nations (2013), claim that cooperatives promote the fullest possible participation in economic and social development for all people.

Although cooperatives are expected to facilitate market participation for small farmers, increase farm incomes, enhance crop productivity and lower production costs (Ma and Abdulai, 2017), there is still no clear and conclusive evidence of what smallholders actually achieve by participating in them (Fałkowski and Ciaian, 2016; Francesconi and Wouterse, 2015). Some studies claim that the positive effects of cooperatives may be unequally distributed among members of different farm sizes (Grashuis and Su, 2019). Bernard and Spielman (2009) suggest that cooperative coordination costs (financial contributions, time for meetings, etc) maybe be higher than the benefits gained from participation for poor farmers, therefore resulting in their de facto exclusion. According to Münkner (2012), the real poor – meaning those living in absolute poverty, having nothing to pool and depending on external aid to survive – lack cooperative capacity; therefore, there is little they can achieve by joining a self-help organisation.

To sum up, from both theoretical and empirical perspectives, whether cooperatives provide their members with benefits remains open to debate. Under the present conditions of economic globalisation and modern agricultural markets, which are simultaneously imposing new

challenges on cooperatives as well as renewed interest in promoting them as a development tool, better understanding and analysis of cooperative effects in developing contexts is needed.

1.2 Research purpose and scope

The *overarching research objective* of this thesis is to explain and assess the effects agricultural cooperatives have on their members in developing contexts. The *two guiding questions* pursued here are:

1. What are the socio-economic characteristics of farmers who participate in cooperatives?
2. What are the specific effects of agricultural cooperatives on their farmer members?

The first question aims to provide a basis for examining whether the poorer or more disadvantaged farmers actually participate in cooperatives, whereas the second question emphasises the need to analyse what kinds of benefits cooperatives provide their members. Concerning the particular effects to be analysed in my own empirical research, in Argentina and Zambia, the thesis addresses has *two sub questions* which follow on from the guiding questions:

2.1. From an economic perspective, do cooperatives affect prices received by members and how can such effects be explained?

2.2. From a governance perspective, do cooperatives seek to foster inclusion of disadvantaged farmers and, when they do so, what kinds of mechanisms do they employ?

The present thesis seeks to make three *primary contributions*. First, by applying novel and rigorous methods that, to the best of my knowledge, have not yet been used in the cooperative research field, this thesis contributes towards the more systematic study of cooperative effects. Second, whereas most studies tend to discuss the questions regarding member characteristics and cooperative effects separately, by discussing them simultaneously, this thesis adds to the literature by stressing the particular roles cooperatives may play for particular groups of farmers. Third, this thesis makes available policy-relevant knowledge regarding to what extent and by what means agricultural cooperatives can support development processes.

This thesis is composed by a *systematic literature review* of cooperative effects and *empirical research* in two developing countries. Each case offers a different contextual background and perspective for the analysis of cooperative effects in two particular domains: prices received by

farmers in Argentina (first sub question) and inclusion in cooperatives of disadvantaged farmers in Zambia (second sub question).

Regarding the differences between these contexts, whereas Argentina represents a case of absence of governmental support for cooperatives, the Zambian government has relied on cooperatives as a development tool. In Argentina, a structural change and liberalisation process turned markets highly competitive, exacerbated differences in size, and technology among farmers, leading to the absence of specific governmental support for cooperatives. Meanwhile, in Zambia, although reforms introduced in the early 1990s ended governmental cooperative support, since 2002/03 cooperatives have been highlighted as a policy tool for development in the implementation of a large-scale input subsidy program. These two remarkably contrasting cases allow me to analyse and discuss the effects of cooperatives in different institutional contexts. The following paragraphs outline how these empirical cases fit into the research program pursued in this thesis.

First, in the Argentinean case, the agricultural cooperative system has a long tradition, beginning with European immigrants in 1904 (Ressel and Silva, 2008). The system experienced periods of expansion and contraction through much of the 20th century (Coque Martínez, 2002) and, by 1988, around 25% of Argentinean farmers were members of cooperatives (Vargas Sánchez, 1997). However, in 1990, the Argentinean government set in motion a profound economic liberalisation process, which included deregulating and opening markets (Gutman et al., 2003). The resulting and still-existing context has become extremely challenging for cooperatives, since they have to perform in highly concentrated markets, compete with international firms and constantly adapt themselves to international markets. Since agriculture is the main or only economic activity for most farmers, the prices they get for their produce are crucial for their incomes and survival as farmers.

Relevant here is that the literature is not conclusive regarding the effects of cooperatives on prices. On the one hand, the neoclassical literature argues that, because of their different objective function (which is typically assumed to be some version of a service at cost or breaking even), cooperatives operate as a "competitive yardstick" and provide better prices in oligopsonistic environments (Cotterill, 1987; Nourse, 1945). On the other hand, the new institutional economics literature stresses that property rights and governance/management problems may impede the ability of cooperatives to operate efficiently and, consequently, pay competitive prices (Chaddad and Cook, 2004; Cook, 1995; Hendrikse and Bijman, 2002;

Hendrikse and Veerman, 2001; Staatz, 1987; Vitaliano, 1983). Therefore, cooperative effects on prices remains an interesting topic.

Second, in the Zambian case, the earliest cooperative experience derives from 1914, when European settlers formed the first agricultural marketing cooperative there. After achieving independence from Great Britain in 1964, Zambia's first elected government conceived and supported cooperatives as an economic tool for development, and as a means to implement public policies. Yet in 1991, similar to the Argentinean case, the economy was liberalised and, consequently, cooperative development once sponsored and controlled by the government was ended, leading to the collapse of many cooperatives (Lolojh, 2009). Since the agricultural season of 2002/03, however, Zambia has been executing a large-scale input subsidy program, mainly for small but viable maize farmers (cultivating between 0.5 and 5 hectares), which is implemented through cooperatives and other farmer groups (Mason et al., 2013). Whereas other sub-Saharan countries such as Malawi, Nigeria and Kenya organise access to subsidised inputs via voucher systems (Jayne and Rashid, 2013), Zambia relies on cooperatives to perform this function.

In many developing countries, cooperatives face a conflict between efficiency and equity. They are subject to norms and values of social inclusion, and solidarity which may clash with the economic need of dealing with more business-oriented or better-performing members to survive (Lutz and Tadesse, 2017; World Bank, 2008). Therefore, the degree to which cooperatives can be inclusive of disadvantaged farmers – without jeopardising their own survival – remains crucial for governments or donors who rely on cooperatives to implement development policies or projects.

1.3 A framework for analysing cooperative effects

A conceptual framework – as an analytical device that offers a logical structure of connected concepts to display the approach of a research study (Grant and Osanloo, 2014) – articulates a structure assumed to best explain the processes involved in phenomena under investigation (Camp, 2001). With this in mind, to analyse cooperative effects, in the following I first conceptualise cooperatives, then refer to the factors that may influence their performance and, lastly, characterise the functions and effects they may have.

In 1844, the English Rochdale Society of Equitable Pioneers founded a consumer cooperative and, with its Principles, set out ideals for the operation of cooperatives. Since then, various definitions of cooperatives and schools of cooperative thought have developed (Laidlaw, 1974), with different combinations of normative, ideological, theoretical or pragmatic perspectives. In 1966, the International Cooperative Alliance (ICA), an independent non-governmental organisation that brings together, represents and serves cooperatives all over the world, proposed a renewed version of the Rochdale Principles. In 1995, the ICA established one of the most widely agreed upon definitions of a cooperative as "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically controlled enterprise." (International Cooperative Alliance, 1995, no page). The ICA poses this definition as a minimal guideline. In other words, it set the minimum requirements for an organisation to be considered a cooperative. Nevertheless, there are deviations or different interpretations of this definition. For instance, as mentioned above, the democratic control of cooperatives in developing countries has been undermined or even suppressed many times due to state intervention, influence of donor agendas, or elite capture. Therefore, I agree with Münkner (2012) that the ICA definition can best be seen as an ideal towards which cooperative organisations should orient themselves.

In the agricultural field, Barton (1989) proposed three principles that should characterise all agricultural cooperatives:

- The user-owner principle: the people who own and finance the cooperative are those that use it as well;
- The user-control principle: the cooperative is controlled by those who use it; and
- The user-benefits principle: benefits of the cooperative are distributed to its users on the basis of their use.

Cooperative principles can also be understood as a set of rules that provide guidance on what members and cooperative organisations are to do for each other (Nilsson, 1996). This would represent a more pragmatic way of discerning what a cooperative is from what a cooperative is not than the ICA definition.

Cooperatives do not operate in a vacuum, so they have to be explicitly oriented towards a wider context that is likely to affect them (Holmén, 1990). An overarching factor that influence cooperative roles and effects is the *institutional environment*, which includes the social, cultural, political and legal contexts in which cooperatives are embedded (Bijman, 2012). For instance, cooperative legislation, market regulation, and competition policies together with incentive

policies and technical assistance provision may create very different contexts for cooperatives in different countries (Sexton and Iskow (1992) as cited in Brusselaers et al., 2012). The institutional environment in turn affects two other important factors for cooperative performance: markets and consequent industry structure, and internal cooperative governance.

Cooperatives operating in *markets* characterised by large transaction costs may have better chances of reaping benefits for their members by decreasing such costs. For instance, transaction costs in non-perishable staple food sectors may be lower than in higher-value perishable food sectors (Alene et al., 2008). Therefore, cooperatives may be more likely to be found in sectors like horticulture than in maize (Hellin et al., 2009). Moreover, shorter supplies chains, meaning for products that are mostly locally sold, may offer fewer potential benefits of integration than larger supplies chain focusing on international markets, in which cooperatives can decrease the higher transaction costs to comply with food standards (Verhofstadt and Maertens, 2014).

Industry structure can be characterised by levels of industry rivalry, supplier and buyer power, and threats of entry and substitution (Porter, 1979). Rivalry here refers to the number of firms competing within a sector. If there is only a small number of firms buying produce in a particular area, they may exercise market power over farmers and pay them unfair prices, in which case a cooperative may pay better prices, since its objective is not usually to maximise profits (Nourse, 1945). In general terms, any situation in which there is supplier- or buyer-side market power, unfavourable conditions may be imposed on farmers, potentially spurring the creation of a cooperative. Threats of entry of competitors or product substitution may condition the strategies of cooperatives regarding prices, advertisement, investment and quality of produce traded, among other potential issues.

Governance defines the system of authority, direction and control within and outside the firm, which seeks to ensure that management works in the best interests of its owners and enables them to obtain the greatest possible benefits from their contributions or investments (Hanisch and Rommel, 2012). For cooperatives, there is no external control (for instance through stock markets); therefore, their internal governance refers to their organisational structure, decision-making processes adopted, roles of governing bodies, and allocation of control rights to members and professional management (Bijman, 2012). A crucial factor influencing cooperative governance relates to the membership. A cooperative with a larger and heterogeneous membership may have higher transaction costs in the process of collective

decision making because members may try to form coalitions to shift benefits in their direction (Hansmann, 1988). On the other hand, this cooperative may reach economies of scale more easily than a cooperative with fewer members.

In sum, institutional environments, market and industry structures, and internal governance influence cooperative performance. Understanding cooperatives as self-help organisations that farmers join to solve their pressing problems, cooperative *functions* can be described as the tasks they perform to enable their members to solve such problems (Münkner, 1995). Following Cropp and Ingalsbe (1989) as cited in Krivokapic-Skoko (2002), cooperatives can be categorised according to their primary functions into production cooperatives (common ownership, planning and production), marketing cooperatives (bargain for, process or manufacture and sell products), supply cooperatives (deal in farm production supplies and equipment) and service cooperatives (credit, insurance, technical assistance, etc.). To these, I add a transversal policy-advocacy function (Thorp et al., 2005) because, especially in developing contexts, during periods of strong government intervention in the economy, national or regional cooperatives can advocate for better farm prices, subsidies or other favourable interventions for their members. In more recent periods of less direct government intervention, cooperatives are being invited to represent farmer interests in the design of development strategies and even to participate in their implementation (Stockbridge et al., 2003). Consequently, this function should not be ignored.

While functions refer to the activities that cooperatives undertake, *effects* refer to the resulting changes cooperatives bring about for their members. With the aim of providing a categorisation of effects for analytical purposes but not an exhaustive enumeration of all potential cooperative effects, and recognising that the boundaries of each category may be flexible, I propose that, from a member perspective, cooperatives can have economic effects, such as increases in yield and income; social effects, such as increases in social and human capital; political effects, such as building more favourable policy contexts; and environmental effects, such as the implementation of more sustainable production technologies. Figure 1 provides a graphic representation of the structural relationships between the categories explained above, constituting the conceptual framework I have used to understand and analyse agricultural cooperative effects on the wellbeing of their members. The next section explains how each research paper submitted as part of this thesis contributes to its overall objective.

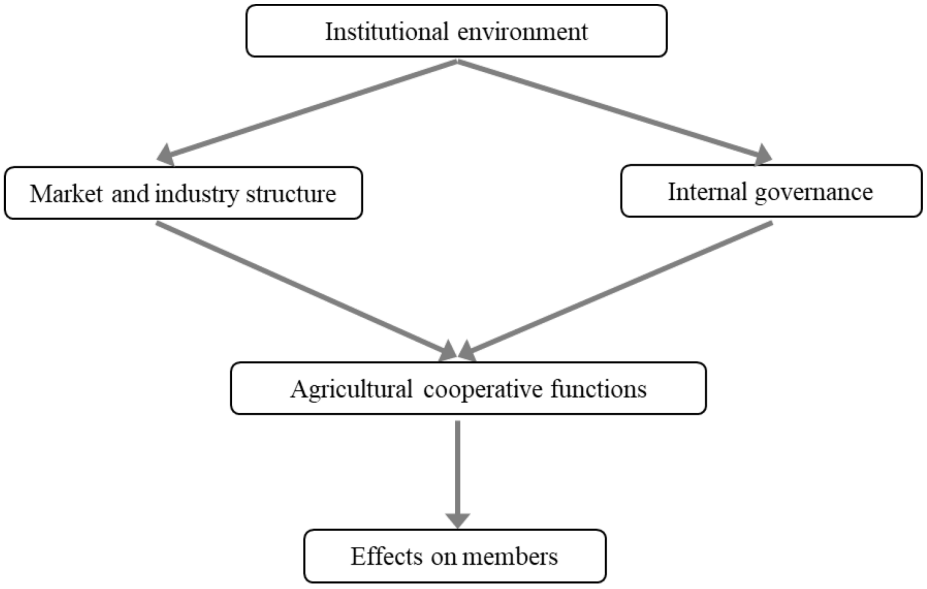

Figure 1: Framework for analysing agricultural cooperative effects on members
Source: own graphic, based on Bijman (2012) and Mazzarol et al. (2014)

1.4 Contributions of the papers to the thesis and its organisation

All the papers constituting the body of this thesis are intended to contribute towards reaching its overarching research objective – regarding the effects that cooperatives have on their members in developing contexts – and answering its two guiding questions, concerned with the characteristics of cooperative farmers and effects. Broadly speaking, Paper One presents a systematic literature review of cooperative effects at the member level. The Paper Two and Three analyse the price effects of cooperatives in the non-varietal wine and dairy sectors in Argentina, respectively, both of which are sectors with high value added and a functioning cooperative system (Obschatko et al., 2011). The Paper Four analyses inclusion mechanisms in maize cooperatives in Zambia, where maize is the main commercial and staple crop (Mason et al., 2013). Below, I frame the papers more precisely and specify their contributions towards answering my research questions.

The Paper One presents a systematic literature review of cooperative effects on members. To the best of my knowledge, thus far, no systematic literature review of cooperative effects – in the sense of an appraisal and synthesis of primary research papers using a rigorous and clearly documented method regarding search strategy and selection of papers, with the aim of minimising bias in the results (Green et al., 2011) – has been conducted. My review analyses 70 primary research articles that study cooperative effects in developing countries and have

been published in peer-review journals in English during the period 1997–2017. It provides a descriptive analysis of countries and sectors studies, along with the functions of cooperatives and sources of support. Then, it analyses member versus non-member characteristics. Finally, after having applied an ad-hoc methodology to categorise articles according to their scientific rigour, it analyses cooperative effects found in articles considered most rigorous. By studying if there are differences in the characteristics between members and non-members, and what kinds of cooperative effects good-quality scientific articles have found, the paper contributes towards answering both of my guiding questions.

The Paper Two specifically analyses cooperatives in the Argentinean non-varietal wine sector. In 2013, Argentina was the eighth largest grape-producing country in the world, the fifth largest wine producer and the ninth largest wine exporter (International Organisation of Vine and Wine, 2015). The province of Mendoza, which accounts for 66% of all of Argentina's vineyards and for 76% of its national wine production, is characterised by the coexistence of small-scale vineyards (*minifundios*) and large-scale vineyards. From the 1950s until the mid-1970s, the state supported the organisation of wine cooperatives (Fabre, 2005; Richard-Jorba, 2008). In 1990, the state-owned winery Bodegas y Viñedos Giol, known as the largest winery worldwide, was privatised and taken over by the Argentinean Federation of Wine Making Cooperatives (FeCoVitA). In 2010, cooperatives processed 20% of the province's grape production through 41 cooperatives and, overall, grape producers linked to the cooperative system represented 33% of the total grape producers in the province.

The Paper Two initially presents and discusses the theoretical and empirical literature regarding cooperative effects on prices at the farmer level and market structure. Then, it analyses 5,042 records of the sale of bulk non-varietal wine, using a multi-level regression model to explain prices according to delivery decision (cooperative or not) and department, controlling for factors such as farm structure and wine colour.[1] It also analyses and discusses the effects of cooperatives as policy advocates. The paper contributes towards answering my first sub question by analysing whether cooperatives pay higher or lower prices than IOFs and if they induce higher prices in markets where they have greater market strength. It also contributes towards answering the guiding question related to member characteristics, by considering whether there are differences in farmer size corresponding to their delivery decisions and department.

[1] Departments here refer to political subdivisions within a province.

The Paper Three studies the dairy-processing sector in Argentina. In 2015, the country produced more than 11,000 million litres of milk, and it was the third largest exporter of whole-milk powder in the world (Ministry of Treasury and Public Finances, 2016). As in most other milk-producing countries, beginning in 1930, Argentina developed a strong cooperative system that introduced modern processing technologies and spread implementation of new agricultural practices among farmers. However, since the structural reforms in the 1990s, the cooperative system has been struggling to adapt to the changing scenarios and, as a result, between 1996 and 2014, the number of farmers delivering their milk to cooperatives sharply decreased – from 8,000 to 1,400 – meaning in practice that many farmers left milk production altogether, with some who continued milk production leaving their cooperatives, while others retained membership (Ministry of Agroindustry, 2014).

Given this context, the Paper Three aims to understand the role of Argentinean dairy processing cooperatives and their effects on farmers by exploring why some of them stayed with their cooperatives, while others decided to leave. First, a data set with 917 records at farmer level is used to estimate a probit model regarding members and non-members characteristics. A complementary data set, with 46,400 monthly records of milk sales, enables detailed analysis of the size and heterogeneity of farmers with reference to their delivery decisions. Both analyses contribute towards answering the guiding question concerned with cooperative member characteristics. Second, a data set with 9,720 monthly records of milk sales between farmers and firms is used to estimate a multilevel regression model to analyse the determinants of milk prices at the farmgate level and calculate price volatility according to different kinds of buyers. Both of these last analyses contribute towards answering the first sub question concerning cooperative price effects.

Both the Paper Two and Three are based on unique large data sets of prices paid to farmers by cooperatives and IOFs at the transaction level for a range of agricultural years and geographical regions, which would not generally be easy to access or collect on such a scale in other contexts. Consequently, both papers are able to perform diverse analyses that go beyond simple price differentials among cooperatives and IOFs. The wine-sector paper elaborates on the different potential directions cooperative effects can have on prices, according to regions and market structures, whereas the dairy paper includes an assessment of price volatility according to kinds of buyer.

The Paper Four focuses on the maize sector in Zambia, where the Farmer Input Support Programme (FISP) relies on cooperatives to organise farmer access to subsidised inputs. This is a rationed program, meaning that subsidies are insufficient to fully serve all eligible farmers. Thus, whether cooperatives are inclusive of the most disadvantaged farmers is crucial for them being able to access FISP benefits. Consequently, this paper presents, discusses and operationalises the concept of inclusion in cooperatives, which has remained difficult to grasp in the development literature. Moreover, thus far, the majority of empirical studies on this issue have conceptualised inclusion in the realm of market access or value chains and, only to a lesser extent, within the context of public policies (Lutz and Tadesse, 2017; Markelova and Mwangi, 2010).

The Paper Four uses primary data collected in 2015 from 15 cooperatives and applies the Qualitative Comparative Analysis (QCA) method to identify all necessary and/or sufficient factors, and their combinations that can lead to inclusion of female widows. Based on discussions with government representatives and members of selected organisations, for the purposes of this study, female widows are considered to be the most disadvantaged group of Zambian maize farmers. Based on the literature and case knowledge, four factors that may foster inclusion are conceptualised and operationalised: participation cost, organisational commitment, presence of wealthier farmers and pro-poor distribution of benefits. This paper addressed my second sub question by analysing which cooperatives are more inclusive and the mechanisms for inclusion they implement. It also contributes towards answering the guiding question regarding member characteristics by analysing whether disadvantaged farmers tend to become members of cooperatives or not.

Each of the papers presented here emphasises different aspects of the conceptual framework articulated in Figure 1. The Paper One, the systematic literature review, presents the cooperative effects that have been found in research articles that comply with specific criteria for selection and scientific rigour. This paper conducts its analysis across countries and sectors; therefore, individual factors influencing cooperative performance (institutional environment, market and industry structure, and internal governance) are not considered. By contrast, the empirical papers, two through four, focus on specific countries, sectors and effects; therefore, it is important within each of them to consider the particular factors influencing cooperative effects. For instance, they all examine how structural adjustment programs have changed the given institutional environments for cooperatives. However, the second and third papers take a more

economics-oriented perspective and, thus, analyse in detail the respective industries and market structures. Meanwhile, the fourth paper emphasises the internal governance dimension of cooperatives, since the strategies that they apply to foster inclusion are part of their forms of organisational structure and management.

Following the main body of this thesis, comprised of the four papers described above, the final chapter summarises its main results and contributions. Then, policy implications and recommendations are suggested. Lastly, limitations and areas for further research are proposed.

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2 LITERATURE REVIEW (PAPER ONE): SYSTEMATIC LITERATURE REVIEW OF AGRICULTURAL COOPERATIVE EFFECTS ON THEIR MEMBERS: WHAT KINDS OF BENEFITS THEY OFFER AND FOR WHOM

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Presented at the ICA - CCR European Research Conference *Cooperatives and the Transformation of Business and Society*, 21st to 23rd August 2019, Berlin

Abstract

Renewed interest among governments and donors in promoting agricultural cooperatives as tools for rural development has been complemented by an increase in empirical studies measuring their effects on farmer members. However, literature reviews of cooperative effects have been incomplete and, in some cases, subject to bias. Consequently, there is still no clear and conclusive evidence regarding what smallholders achieve by participating in them. Considering articles focused on developing countries published between 1997 and 2017, we conduct a systematic literature review of cooperative effects on their members, finding that cooperatives perform a wide variety of functions in diverse sectors. The evidence regarding claims that better-off farmers are more likely to be cooperative members than poorer farmers remains inconclusive, though, in terms of size, cooperative members with very small farms tend to be the norm. Concerning cooperative effects, the most conclusive evidence is associated with the categories access to and use of inputs, income, prices, and women's status and agency,

which are studied by a significant number of articles and present the greatest shares of positive effects.

Keywords: Agricultural cooperatives; Smallholder farmers; Developing countries

2.1 Introduction

In recent decades, governments and donors have been showing a renewed interest in promoting cooperatives as drivers for rural development (Bretos and Marcuello, 2017; World Bank, 2008). Due to their size, small farmers are disadvantaged compared to larger farmers in terms of their ability to reach economies of scale, exercise bargaining power, and access to capital, markets, information and infrastructure (Trebbin and Hassler, 2012). Cooperatives are expected to facilitate market participation of smallholder farmers, increase farm incomes, enhance productivity, and lower production costs (Ma and Abdulai, 2017). However, there is still no clear and conclusive evidence regarding what smallholders actually achieve by participating in them (Fałkowski and Ciaian, 2016; Francesconi and Wouterse, 2015).

Despite a growing body of research investigating cooperative effects on their farmer members, efforts to review this literature have not been comprehensive. For instance, Tefera et al. (2017) focus on a particular country (Ethiopia), Kwapong and Hanisch (2013) focus only on poverty or van Herck (2014) on efficiency, and Grashuis and Su (2019) focus only on studies using quantitative methods. Other reviews do not specifically cover only cooperatives but, rather, a larger group of organisations (Berkhout et al., 2018; Gugerty et al., 2019). Moreover, most of these studies provide little explanation of the review methods applied; therefore, they may not be exhaustive of the literature or subject to different biases (Durach et al., 2017).

The objective of the present article is to provide, to our best knowledge, the first systematic literature review of the effects of cooperatives on their members by addressing two questions: (1) what are the socio-economic characteristics of farmers who participate in cooperatives? and (2) what are the specific effects of agricultural cooperatives on their farmer members? The first question aims to provide a basis for examining whether the poorer or more disadvantaged farmers actually participate in cooperatives, whereas the second question emphasises the need to analyse what kinds of benefits cooperatives provide their members.

Our review seeks to contribute to the literature by providing a comprehensive summation and evaluation of 70 primary research articles studying the effects of cooperatives in developing

countries that have been published between 1997–2017 in peer-review journals in English. Our descriptive analysis is complemented by an assessment of the scientific rigour of the articles and synthesis of the cooperative effects they indicate by using the vote-counting procedure. Subsequently, we highlight important areas for future research and provide key information for policymakers regarding the state of art of knowledge about cooperative effects.

The remainder of the paper is organised as follows: First, section 2.2 presents a framework to analyse cooperative effects. Section 2.3 then describes the systematic review process, highlighting the inclusion criteria for selecting studies and the procedure for critical appraisal of their scientific rigour. Section 2.4 presents our results and, finally, section 2.5 contains the discussion and conclusions.

2.2 A framework for analysing cooperative effects

Cooperatives as user-owned, user-controlled and user-benefited organisations (Barton, 1989), do not operate in a vacuum, so they have to be explicitly oriented towards a wider context that is likely to affect them (Holmén, 1990). An overarching factor that influence cooperative roles and effects is the *institutional environment*, which includes the social, cultural, political and legal contexts in which cooperatives are embedded (Bijman, 2012). For instance, cooperative legislation, market regulation, and competition policies together with incentive policies and technical assistance provision may create very different contexts for cooperatives in different countries (Sexton and Iskow 1992 as cited in Brusselaers et al., 2012). The institutional environment in turn affects two other important factors for cooperative performance: markets and consequent industry structure and internal cooperative governance.

Cooperatives operating in *markets* characterised by large transaction costs may have better chances of reaping benefits for their members by decreasing such costs. For instance, transaction costs in non-perishable staple food sectors may be lower than in higher-value perishable food sectors (Alene et al., 2008). Therefore, cooperatives may be more likely to be found in sectors like horticulture than in maize (Hellin et al., 2009). Moreover, shorter supplies chains, meaning for products that are mostly locally sold, may offer fewer potential benefits of integration than larger supplies chain focusing on international markets, in which cooperatives can decrease the higher transaction costs to comply with food standards (Verhofstadt and Maertens, 2014).

Industry structure can be characterised by levels of industry rivalry, supplier and buyer power, and threats of entry and substitution (Porter, 1979). Rivalry here refers to the number of firms competing within a sector. If there is only a small number of firms buying produce in a particular area, they may exercise market power over farmers and pay them unfair prices, in which case a cooperative may pay better prices, since its objective is not usually to maximise profits (Nourse, 1945). In general terms, any situation in which there is supplier- or buyer-side market power, unfavourable conditions may be imposed on farmers, potentially spurring the creation of a cooperative. Threats of entry of competitors or product substitution may condition the strategies of cooperatives regarding prices, advertisement, investment and quality of produce traded, among other potential issues.

Governance defines the system of authority direction and control within and outside the firm, which seeks to ensure that management works in the best interests of its owners and enables them to obtain the greatest possible benefits from their contributions or investments (Hanisch and Rommel, 2012). For cooperatives, there is no external control (for instance through stock markets); therefore, their internal governance refers to their organisational structure, decision-making processes adopted, roles of governing bodies, and allocation of control rights to members and professional management (Bijman, 2012). A crucial factor influencing cooperative governance relates to the membership. A cooperative with a larger and more heterogeneous membership may have higher transaction costs in the process of collective decision making because members may try to form coalitions to shift benefits in their direction (Hansmann, 1988). On the other hand, this cooperative may reach economies of scale more easily than a cooperative with fewer members.

In sum, institutional environments, markets and industry structures, and internal governance influence cooperative performance. Understanding cooperatives as self-help organisations that farmers join to solve their pressing problems, cooperative *functions* can be described as the tasks they perform to enable their members to solve such problems (Münkner, 1995). Following Cropp and Ingalsbe (1989), as cited in Krivokapic-Skoko (2002), cooperatives can be categorised according to their primary functions into production cooperatives (common ownership, planning and production), marketing cooperatives (bargain for, process or manufacture and sell products), supply cooperatives (deal in farm production supplies and equipment) and service cooperatives (credit, insurance, technical assistance, etc.). To these, I add a transversal policy-advocacy function (Thorp et al., 2005) because, especially in

developing contexts, during periods of strong government intervention in the economy, national or regional cooperatives can advocate for better farm prices, subsidies or other favourable interventions for their members. In more recent periods of less direct government intervention, cooperatives are being invited to represent farmer interests in the design of development strategies and even to participate in their implementation (Stockbridge et al., 2003). Consequently, this function should not be ignored.

While functions refer to the activities that cooperatives undertake, *effects* refer to the resulting changes cooperatives bring about for their members. With the aim of providing a categorisation of effects for analytical purposes but not an exhaustive enumeration of all potential cooperative effects, and recognising that the boundaries of each category may be flexible, I propose that, from a member perspective, cooperatives can have economic effects, such as increases in yield and income; social effects, such as increases in social and human capital; political effects, such as building more favourable policy contexts; and environmental effects, such as the implementation of more sustainable production technologies. Figure 2 provides the conceptual framework to explain and assess cooperative effects.

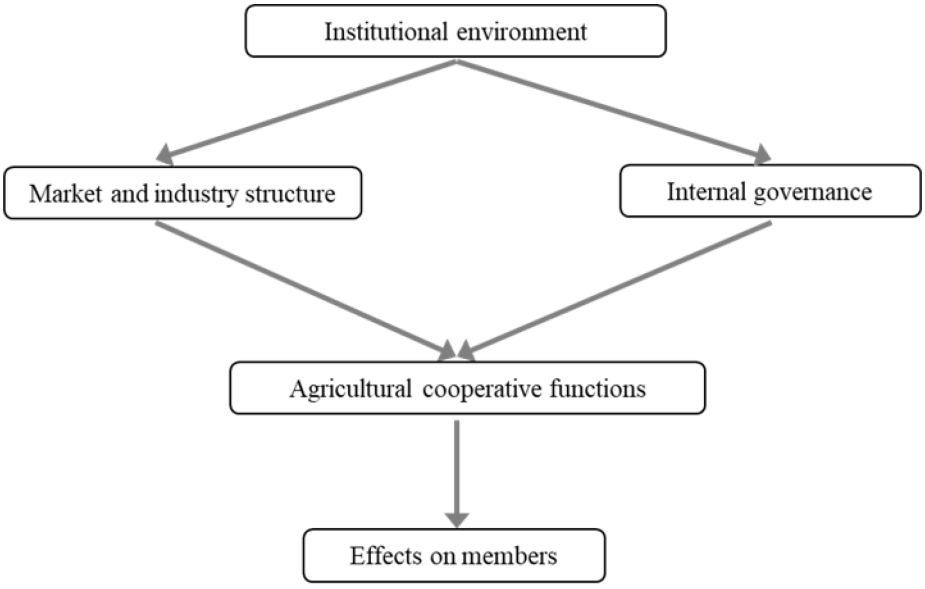

Figure 2: Framework for analysing agricultural cooperative effects on members
Source: own graphic, based on Bijman (2012) and Mazzarol et al. (2014)

2.3 Method

Most literature reviews are based on expert criteria and knowledge (Oxman, 1993). However, due to the increasing amount of published research today, the reviews of that research may not

always properly reflect the actual diversity and breadth of the phenomena under study. Moreover, each step of creating a review may be prone to biases (Durach et al., 2017). To cite one common example, articles retrieved for a review based on inadequate or incomplete search strategies can lead to sampling bias. With the aim of minimising such biases, a systematic literature review is an appraisal and synthesis of primary research articles using rigorous, and clearly documented methods for the search strategy, selection and analysis of articles (Higgins and Green, 2011; Waddington et al., 2012). The steps taken for our own search and analysis process for this review are summarised in Figure 3 and then explained in detail in subsequent sections.

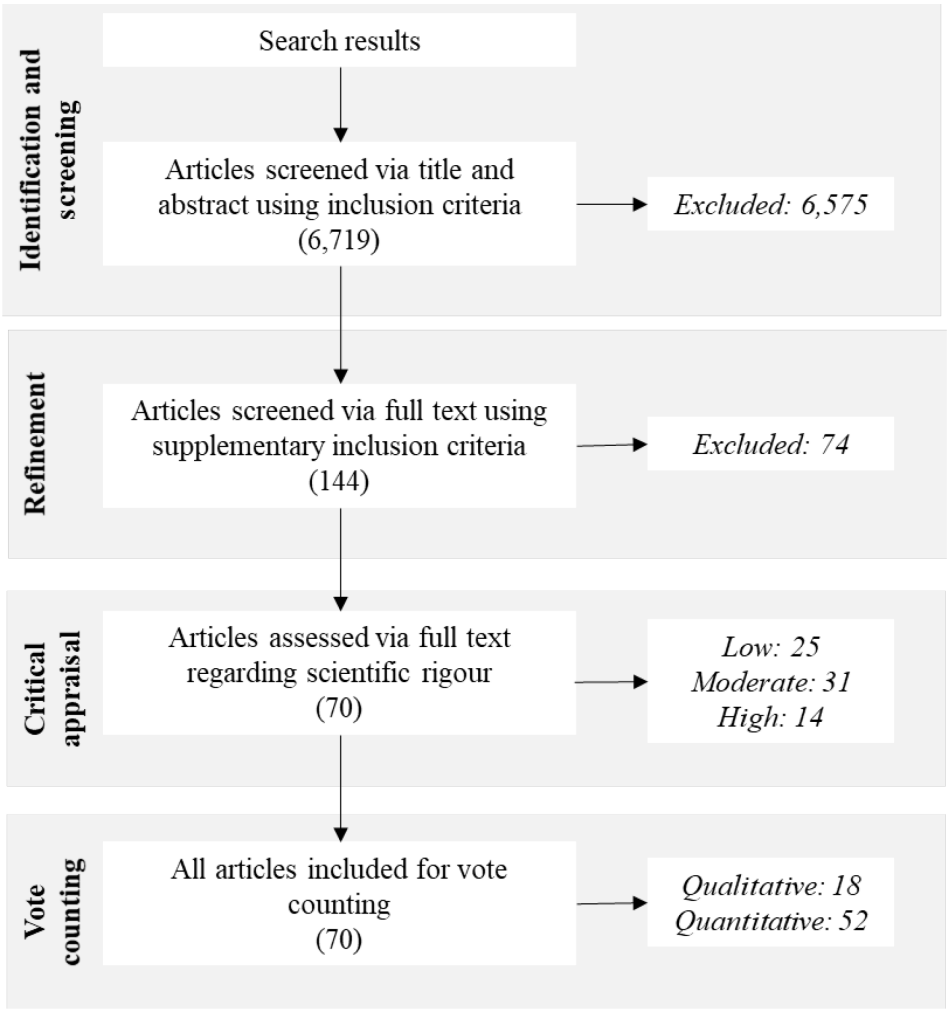

Figure 3: Flow diagram of article search and analysis process for the review

Source: own graphic

2.3.1 Identification and screening

Initially, we identified 6,719 articles and then performed a two-stage sequential screening process. The identification was conducted using 10 databases: Agecon, British Library, De Gruyter, Jstor, Oxford Academics, Sciencedirect, Springer, Taylor and Francis Online, and Wiley, which were split among the three authors of this article.

Because the present study aims to provide an overview of all available evidence, we did not limit our search strategy to specific effects or dimensions. Rather, our search algorithm included combinations and permutations of keywords ('farmer organisation', 'agricultural cooperative', 'farmer group', 'producer organisation', 'producer group', 'association'). Where possible, Boolean operators ('and', 'or'), wild cards (?) and truncation (*) operators were used. Additional keywords ('impact', 'effect') were introduced if the initial search rendered more than 300 results.

In the first stage of the screening process, the researchers screened the titles and abstracts of the identified articles, seeking empirical articles that fulfilled the following inclusion criteria:

- They analysed the effects of cooperatives on members and their production systems (excluding cooperatives operating in fishery or collected non-timber forest product sectors);
- They were published between 1997 and 2017, in English and by a peer-reviewed journal, as indexed in SCImago Journal and Country Rank (2016) or in a journal specialised in the topic, such as Journal of Rural Cooperation or Journal of Cooperative Studies; and
- They were framed within one or more countries categorised as 'developing', according to the United Nations (2018) country classification table.

Where possible, search filters were modified to reflect our inclusion criteria. See Appendix 1 for details of the search parameters and algorithms.

In the second stage of the screening process, potentially relevant articles were retained for assessment, after duplicate articles and those not meeting the inclusion criteria were excluded, amounting to 6,575 articles. Since not all the inclusion criteria could always be observed in the titles and abstracts, the remaining 144 articles were reassessed using a peer-review screening process via full text to confirm that they met the criteria. From this step on, the online software DistillerSR was used to manage articles and their content.

2.3.2 Refinement

We then used the following supplementary inclusion criteria and the full-text information of the remaining articles to refine our selection process:

- The main research objective of the articles was the agricultural cooperatives. Quantitative articles that merely considered membership in cooperatives as an explanatory variable in regression analyses were excluded; and
- The quantitative articles included counterfactuals in the analysis, meaning that they compared members and non-members or a sub group thereof (e.g., female members against female non-members) with each other.

2.3.3 Critical appraisal

Following the refinement step, we then performed a critical appraisal of the remaining 70 studies, in order to identify those with high-enough levels of methodological rigour to qualify for our subsequent vote-counting procedure.[2] A critical appraisal evaluates how consistently a study has been designed and executed (Ryan et al., 2013). With this goal in mind, we adapted a variety of framework-assessment indicators to the specificities of our research field.

For articles using quantitative methods, we assessed their reliability and internal and external validity (Heale and Twycross, 2015; Waddington et al., 2012). We associated higher levels of rigour with, for example, studies controlling for selection bias (reliability), spelling out clear hypotheses and causal mechanisms for their findings (internal validity) and/or applying random sampling of cooperatives or members and non-members (external validity).

For articles using qualitative methods, we considered the credibility, transferability and dependability of their research approaches (Hannes et al., 2011). Among other indicators of rigour, we checked whether articles used corroborating evidence to cross-validate their findings (dependability), clearly laid out their sampling strategy (credibility) or discussed the limitations of drawing wider inference from their results (transferability). See Appendix 1 for details of the rigour-assessment framework.

[2] Due to space limitations, the titles of these 70 articles are not included in the references but are available upon request.

2.3.4 Vote-counting procedure

To synthesise member characteristics and cooperative effects from articles using quantitative methods, we used the vote-counting procedure, which classifies effects according to their statistical significance into significant positive, significant negative and non-significant (Bushman and Wang, 2009). We recorded the statistical significance of studies applying quantitative methods at the 0.1 level. For articles applying qualitative methods, effects were categorised into positive, negative or no effects, when they reported the absence of an effect.

For analytical purposes, we combined continuous and dichotomic variables measuring similar membership characteristics or effects into categories and further classified effects into dimensions. For instance, the membership category *education* brings together variables such as number of years of education and literacy levels, whereas the effect category *income*, belonging to the dimension of economic effects on members, includes variables such as farm income, women's income, share of agricultural income on total income, and the like. Lastly, we reversed the positive and negative votes to ensure consistency in the direction of effects; for instance, a negative effect from cooperatives on poverty levels was reversed to indicate a positive effect on poverty reduction (Lewis and Pattanayak, 2012). See Appendix 1 for an overview of our effect classification.

2.4 Results

2.4.1 Cooperative characteristics

The 70 articles that meet our inclusion criteria, though highly concentrated in terms of year of publication – with around 75% having been published between 2012 and 2017 – come from a wide variety of authors (N=163) and journals (N=42). Below we go into detail about which countries, sectors and cooperative functions, among others, were analysed in the articles.

Regarding organisational form, cooperatives were the most frequently studied (58%), followed by farmer groups (15%) and associations (12.5%). Most of these organisations tend to orientate themselves according to cooperative principles but differ in terms of their legal status, with most countries recognising cooperatives as legal entities but not necessarily the other organisational forms. In some cases, the word *cooperative* has been associated with previous periods of socialist regimes; therefore, a different name is now used to create a sense of distance

from them. For the purposes of our review, we use the word *cooperative* to refer to all organisations studied by the articles discussed here.

In terms of geographical location, the articles are highly concentrated. Whereas 4 articles focus on more than one country, the vast majority focuses on a single one. At the continent level, 56% of the articles concentrate on Africa, 31% on Asia and the remaining 13% on Latin America and the Caribbean. Nevertheless, although these articles are spread across 30 different countries, their concentration at the country level is considerable, with 7 countries accounting for 63% of all studies: Ethiopia (13), India (10), Rwanda (5), Kenya (4), Nigeria (4), Uganda (4) and Vietnam (4).

Most cooperatives are focused on one agricultural sector. Among our articles, 56 explicitly mention the agricultural sector, with only 9 of these focusing on more than one agricultural sector. The remaining 14 articles do not provide any sector-specific information, with many of them analysing data from national agricultural surveys and reporting on agricultural cooperative effects. Even though the articles refer to 32 different agricultural sectors overall, concentration among a few sectors is high, with 64% of them concentrating on 6 sectors: coffee (14), maize (6), cassava (4), green beans (4), horticulture (4) and rice (4). Of these, only coffee and horticulture are generally considered high-value products. Thus, we do not see enough evidence to support claims in the literature of cooperatives generally focusing on high-value products.

Most cooperatives combine multiple functions. Of the 52 (75%) articles describing cooperative functions, 46 mention marketing, and 34 of these combine it with other functions, with supply of inputs being the most cited (13), followed by access to technical assistance (11). Of the 6 remaining cooperatives studied, most provide access to technical assistance and training (5), and some combine it with other services (2). Overall, it is important to highlight that only 6 of the cooperatives studied offer access to credit and another 6 to processing services. Considering that most farmers in developing countries lack financial capital and have limited possibilities for increasing their participation in value chains, cooperatives do not appear to be offering much in that direction, at least according to the results of the reviewed articles.

A large number of cooperatives receive external support, mainly from governmental sources, sometimes from more than one organisation. Of the 45 (64%) studies mentioning external support, 10 of them indicate that it comes from multiple sources. Governments provide support

in 22 (50%) cases, followed by non-governmental organisations (11 cases) and international organisations (6 cases). In 16 cases, governments supported the establishment of cooperatives, while in 6 of them support is continued as access to subsidies for cooperatives (3) or subsidised inputs for their members (3). In 4 of the 6 remaining cases, governments provide access to training. Since none of the articles refer explicitly to the public advocacy function of cooperatives, but they do acknowledge governmental support, we assume that most of these organisations are still seen merely as policy tools rather than partners in policy development. It is important to note that not all articles explicitly mention the presence or absence of external support. For instance, only 3 out of the 13 articles on Ethiopia acknowledge the government's strong promotion and organisation of cooperatives throughout the country. Therefore, the real number of cases showing governmental support is probably larger. Figure 4 sums up the key characteristics of cooperatives mentioned in the literature we have reviewed.

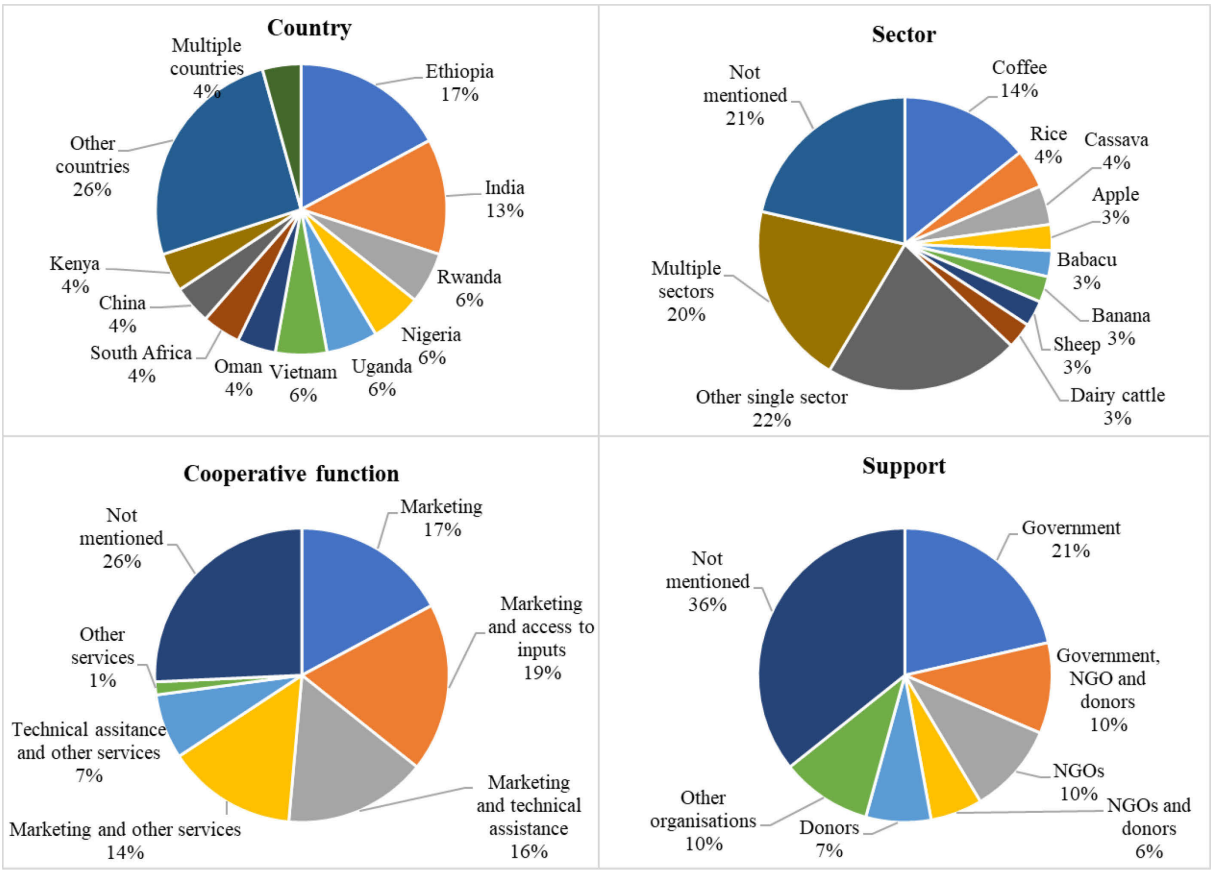

Figure 4: Cooperative characteristics

Source: own graphic

Moving on from cooperative characteristics identified by the articles to the main methods they used, 52 (75%) relied on quantitative and the remaining 18 (25%) on qualitative methods.[3] Around 25% of the quantitative studies combined different techniques, with the most mentioned being propensity score matching (24 studies), difference in means (10), ordinary least squares regressions (8) and two-stage regression models (8). All qualitative studies applied the case study method, combining focus group discussions and/or expert interviews with cooperative leaders and members.

Summing up, what is known about cooperatives through the articles examined here is based upon a very limited set of cases, since many of the articles are highly concentrated in terms of publication date and geographical locations and agricultural sectors investigated. Yet, there are very few articles analysing the same country and sector, limiting the possibility of corroborating, comparing or complementing their results. Nevertheless, in terms of agricultural functions and sources of external support, we can say that cooperatives exhibit a wide variety, with many of them having multiple functions and sources of support. Lastly, around 25% of the articles reviewed do not provide any information on the agricultural sectors or cooperative functions they investigated, which may hinder their ability to explain the effects of cooperatives beyond theoretical formulations.

2.4.2 Member characteristics

Aiming to find out if relatively more-disadvantaged farmers tend to become cooperative members, we have analysed member and non-member characteristics. One perspective within the literature holds that farmers who are better off, in terms of human and physical capital and access to infrastructure, are more likely to join cooperatives than the most disadvantaged farmers, who may lack cooperative capacity due to having nothing to pool into a cooperative (Münkner, 2012). Meanwhile, another perspective claims that the most disadvantaged farmers may be intentionally excluded by cooperatives so they can diminish the transaction costs involved in dealing with numerous and very small-scale farmers (Dries et al., 2009; Ito et al., 2012).

[3] Only 8 studies combined quantitative and qualitative methods.

In our selection, 38 articles (54%) have analysed member and non-member characteristics. The most frequent techniques of analysis used include probit regressions (20 articles), difference in means (11) and logit or logistic regressions (5).

As mentioned in the previous section, for analytical purposes, we have grouped variables into categories and then done vote counting, only focusing on categories studied in at least 5 articles. Then, we classified categories according to whether they seem to have had a positive effect on membership, if more than 50% of the available data indicated an effect in that direction; the same applied for categories with negative effects. This classification system has yielded 18 categories, as detailed in Table 1. While farmers who are better off in terms of education, farm size, access to credit and income level are more likely to be cooperative members, this does not seem to hold for variables such as farm equipment, information and communication technology assets or access to extension services. Therefore, we do not see enough evidence to support claims in the literature of better-off farmers being more likely to participate in cooperatives.

Table 1: Agricultural cooperative member and non-member characteristics mentioned in reviewed articles (N=38)

Feature	Category	Influence on membership			Total number of articles
		Positive	Negative	Non-significant	
Farmer	Age	15 (50%)	5 (17%)	10 (33%)	30 (100%)
	Education	19 (59%)	1 (3%)	12 (38%)	32 (100%)
	Farming experience	3 (50%)	0	3 (50%)	6 (100%)
Household	Child-dependency ratio	3 (60%)	0	2 (40%)	5 (100%)
	Household size	9 (39%)	1 (4%)	13 (57%)	23 (100%)
	Male head	6 (32%)	4 (21%)	9 (47%)	19 (100%)
Farm	Access to credit	3 (60%)	0	2 (40%)	5 (100%)
	Farm size	19 (60%)	6 (20%)	6 (20%)	31 (100%)
	Number of animals	9 (64%)	0	5 (36%)	14 (100%)
	Farm equipment	4 (50%)	1 (12%)	3 (38%)	8 (100%)
	Information and communication technology assets	4 (44%)	1 (12%)	4 (44%)	9 (100%)
	Crop diversity	0	1 (20%)	4 (80%)	5 (100%)
Distance	Proximity to roads or markets	8 (50%)	2 (12%)	6 (38%)	16 (100%)
	Proximity to urban settlements	2 (40%)	0	3 (60%)	5 (100%)
Income	Farm or total income	5 (56%)	1 (11%)	3 (33%)	9 (100%)

	Off-farm income	4 (29%)	4 (32%)	5 (39%)	13 (100%)
Extension service	Access to or contact with extension service	2 (33%)	0	4 (67%)	6 (100%)
	Number of contacts with Non-Governmental Organisations (NGOs)	1 (50%)	1 (50%)	0	2 (100%)

Source: own compilation

Of the 38 articles analysing farmer characteristics, 24 provide information about differences in mean farm size and their statistical significance. While 6 articles find non-significant differences in mean farm size, 17 out of the 18 remaining articles find that cooperative members have significantly larger farmers than non-members (at the 0.1 level). However, when categorising farmers regardless of their membership status, in 9 (59%) cases members and non-members have less than 1 hectare. Worldwide, farmers with less than 2 hectares are defined as small farmers (Lowder et al., 2016). This means that, even though from a statistical perspective members' farms are relatively larger than those of non-members, from a socio-economic perspective they should all be considered very small or subsistence farmers. Moreover, only in 2 cases do farmers have more than 4 hectares of land. Figure 5 shows the complete distribution of farm sizes across cases.

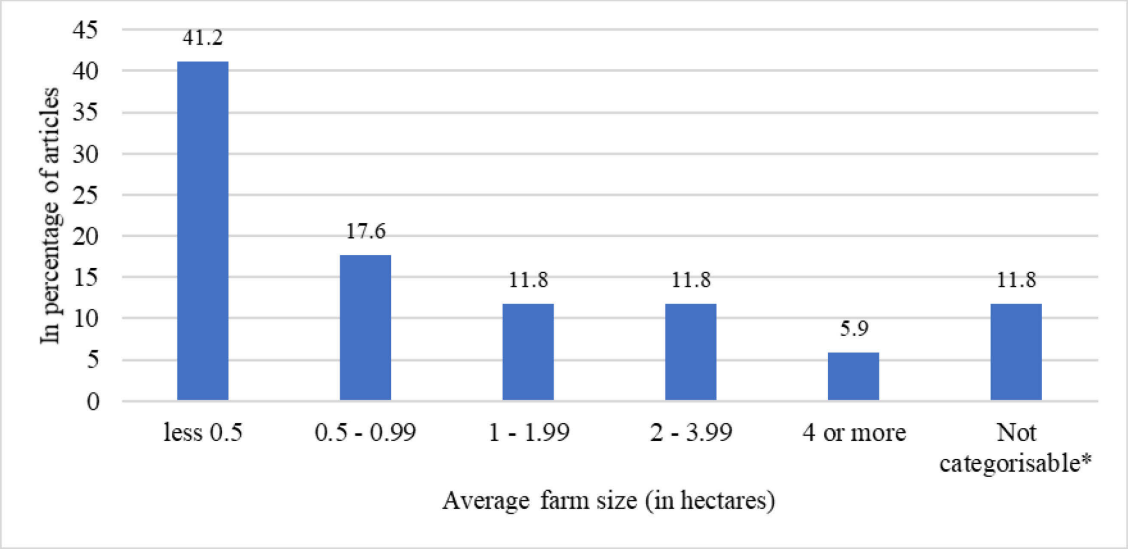

Figure 5: Average farm size in articles indicating that cooperative-member farms were on average significantly larger than those of non-members (N=17)

*Some articles were not clearly categorisable when members and non-members belonged to different interval classes (e.g., members had more than 1 hectare and non-members had less than 1 hectare).

Source: own graphic

Summing up, even though a slight majority of the reviewed articles (55%) analyse member characteristics, most of their results seem to be inconclusive. In 5 out of the 18 categories assessed, the proportion of non-significant results is 50% or larger. This absence of evidence inhibits the formulation of further claims (Leppink et al., 2017), suggesting a need for further research to define variables differently or use other measurement techniques that may render a larger share of significant effects.

2.4.3 Cooperative effects

As already mentioned above, we have classified the reviewed articles according to their main mode of analysis (quantitative or qualitative methods) and in terms of the effects of cooperatives they have found, organised into 3 overarching dimensions (i.e., environmental, social, economic) and 17 categories (e.g., income, food security). Quantitative methods (75% of articles) were more frequently employed than qualitative (25%). Regarding dimensions covered, whereas effects in the quantitative articles are largely focused on one particular dimension (39 of 52 articles), two-thirds of the qualitative ones combine effects from multiple dimensions (12 of 18 articles). Across methods, the most common combination of effect categories is social and economic, accounting for 14 of the 25 articles registering multiple-dimension effects. Table 2 provides the full breakdown of methods used and dimensions covered by the reviewed articles.

Table 2: Dimensions covered and methods of analysis employed by reviewed articles (N=70)

Number of dimensions	Dimensions	Method		Total
		Qualitative	Quantitative	
One dimension	Economic	3 (17%)	29 (56%)	32
	Environmental	1 (5%)	4 (8%)	5
	Social	2 (11%)	6 (11%)	8
Multiple dimensions	Economic and social	8 (44%)	6 (11%)	14
	Economic and environmental	3 (17%)	4 (8%)	7
	Social and environmental	(0%)	3 (6%)	3
	Economic, environmental and social	1 (6%)	(0%)	1
	Total	**18 (100%)**	**52 (100%)**	**70**

Source: own compilation

Regarding the direction of effects, quantitative articles are more likely to combine positive, negative and/or non-significant effects and report the absence of positive effects than qualitative articles. While 38.5% of the quantitative articles report only positive effects, this share reaches

61.1% in qualitative articles. Around 50% of the quantitative articles combine positive, negative and/or non-significant effects, as compared to 38% of the qualitative ones. See Figure 6 for more details.

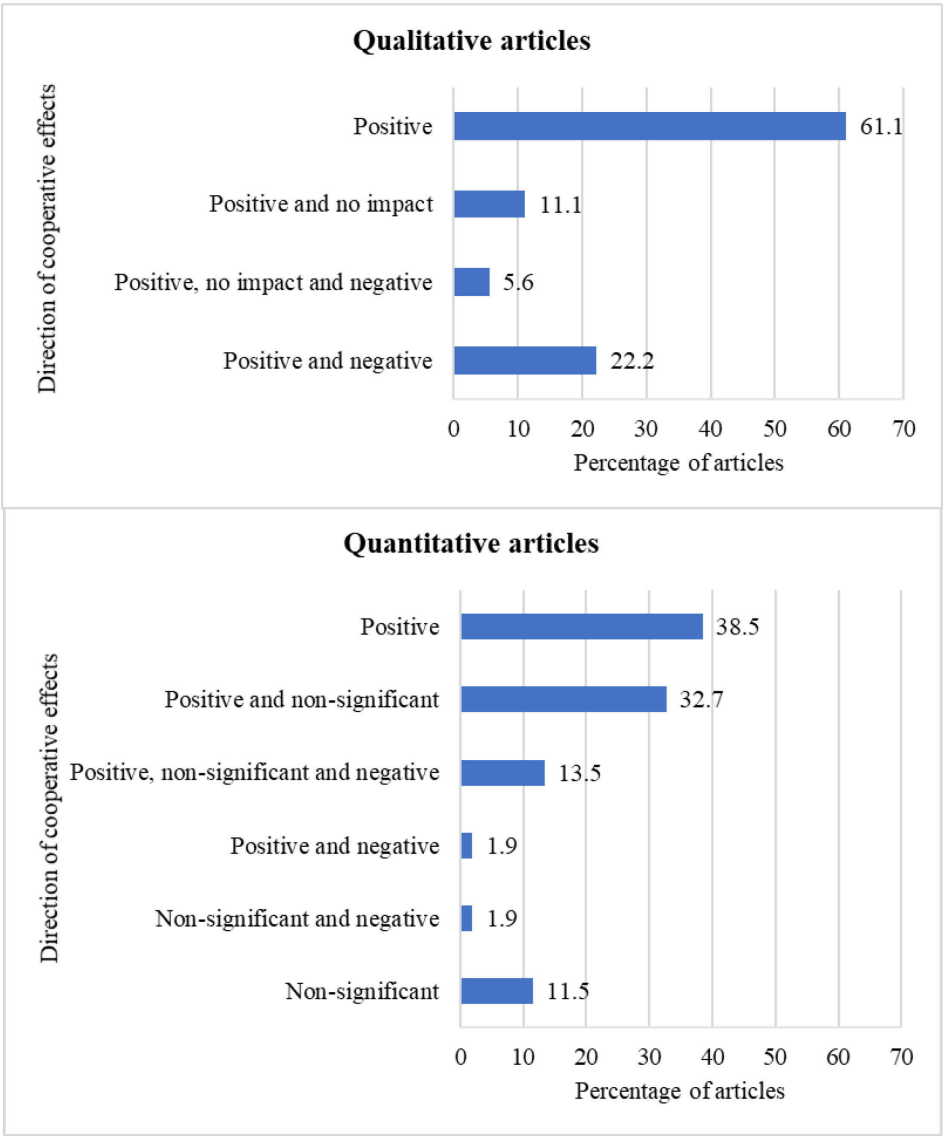

Figure 6: Reviewed articles classified according to methods employed and direction of cooperative effects (N=70)

Source: own graphic

Classifying the reviewed articles according to their levels of methodological rigour, as explained in section 2.3.3, we find that, although the shares of articles with low levels of rigour is similar between quantitative and qualitative articles (35% and 39%, respectively), the share of quantitative articles having higher levels of rigour is over double that of the qualitative ones (23% versus 11%). Consequently, the share of moderately rigorous studies is smaller among quantitative than qualitative articles (42% versus 50%). See Table 3 for the overview.

Table 3: Methodological rigour of reviewed articles, categorised by research method (N=70)

Rigour	Qualitative	Quantitative	Total
Low	7 (39%)	18 (35%)	25 (36%)
Moderate	9 (50%)	22 (42%)	31 (44%)
High	2 (11%)	12 (23%)	14 (20%)
Total	**18 (100%)**	**52 (100%)**	**70 (100%)**

Source: own compilation

Focusing on articles with high and moderate levels of rigour, we find that, on average, 75% of all effects analysed in the 11 relevant qualitative articles are positive, 6% are negative and the remaining 19% correspond to situations where no effect was perceived by the members interviewed or included in focus groups. The most frequently analysed effects belong to the categories market participation, women's status and agency, and human capital. Table 4 details this information.

Table 4: Cooperative effects identified by qualitative articles reviewed exhibiting high and moderate levels of rigour (N=11)

Dimension	Effect category	Effects			Total effects	Number of articles
		Positive	Negative	No effect		
Environmental effects	Environmental performance	2 (50%)	0	2 (50%)	4 (100%)	3
Economic effects on members	Financial services	1 (50%)	0	1 (50%)	2 (100%)	1
	Income	2 (100%)	0	0	2 (100%)	2
	Market participation	8 (80%)	0	2 (20%)	10 (100%)	5
	Prices	1 (100%)	0	0	1 (100%)	1
Economic effects on production system	Access to and use of inputs	3 (43%)	1 (14%)	3 (43%)	7 (100%)	3
	Access to and use of technology	1 (100%)	0	0	1 (100%)	1
	Yield and quantity	1 (100%)	0	0	1 (100%)	1
Social effects	Food security	1 (100%)	0	0	1 (100%)	1
	Health	0	0	1 (100%)	1 (100%)	1
	Human capital	5 (100%)	0	0	5 (100%)	4
	Social capital	1 (100%)	0	0	1 (100%)	1
	Women's status and agency	9 (82%)	2 (18%)	0	11 (100%)	5
Total		**35**	**3**	**9**	**47**	

Source: own compilation

On average, the 34 quantitative articles with high and moderate levels of rigour find 67% positive cooperative effects, which is 8% less than for the qualitative articles. Although the average share of negative effects does not differ much between qualitative and quantitative articles (4.6% vs 6.4%), the latter present a considerably greater share of non-significant effects (29% vs 19%). The most studied effect categories are income and access to and use of inputs. Table 5 details this information.

Table 5: Cooperative effects identified by quantitative articles reviewed exhibiting high and moderate levels of rigour (N=34)

Dimension	Effect category	Effects			Total effects	Number of articles
		Positive	Negative	Non-significant		
Environmental effects	Environmental performance	3 (50%)	1 (17%)	2 (33%)	6 (100%)	5
Economic effects on members	Financial services	3 (100%)	0	0	3 (100%)	2
	Income	26 (72%)	0	10 (28%)	36 (100%)	18
	Market participation	3 (30%)	2 (20%)	5 (50%)	10 (100%)	7
	Prices	6 (67%)	1 (11%)	2 (22%)	9 (100%)	8
	Wealth	4 (80%)	0	1 (20%)	5 (100%)	4
Economic effects on production system	Access to and use of inputs	14 (82%)	0	3 (18%)	17 (100%)	10
	Access to and use of technology	2 (40%)	0	3 (60%)	5 (100%)	1
	Labour	3 (75%)	0	1 (25%)	4 (100%)	3
	Technical efficiency	4 (80%)	0	1 (20%)	5 (100%)	4
	Yield and quantity	5 (46%)	2 (18%)	4 (36%)	11 (100%)	7
Social effects	Food security	2 (50%)	0	2 (50%)	4 (100%)	3
	Human capital	4 (100%)	0	0	4 (100%)	4
	Social capital	3 (75%)	0	1 (25%)	4 (100%)	4
	Women's status and agency	4 (67%)	0	2 (33%)	6 (100%)	4
Total		**86**	**6**	**38**	**130**	

Source: own compilation

Most effects can be grouped according to the number of articles reporting them and the share of times they were categorised as being positive. In this vein, the group of effect categories "more known" are those studied by many articles and showing a large share of positive effects condenses the state of art of knowledge in the field. This group is composed by the categories: access to and use of inputs, income, price, and women's status and agency.

There are two particularly interesting groups for future research. The first consists of "more probable" effects, referring to categories only studied by a few articles but with a relatively high share of positive findings: financial services, profits, social capital and technical efficiency. The second notable group consists of "less known" effects, referring to those that were also studied by only a few articles but with low shares of positive findings: access to and use of technology and food security.

Lastly, the group of the "less probable" effects refers to categories studied by many articles but with a relatively low share of positive findings: environmental performance, market participation, and yield and quantity. It is interesting to mention that even most cooperatives provide marketing services, they do not seem to be particularly successful in increasing the quantities commercialised by members. Figure 7 completes this information.

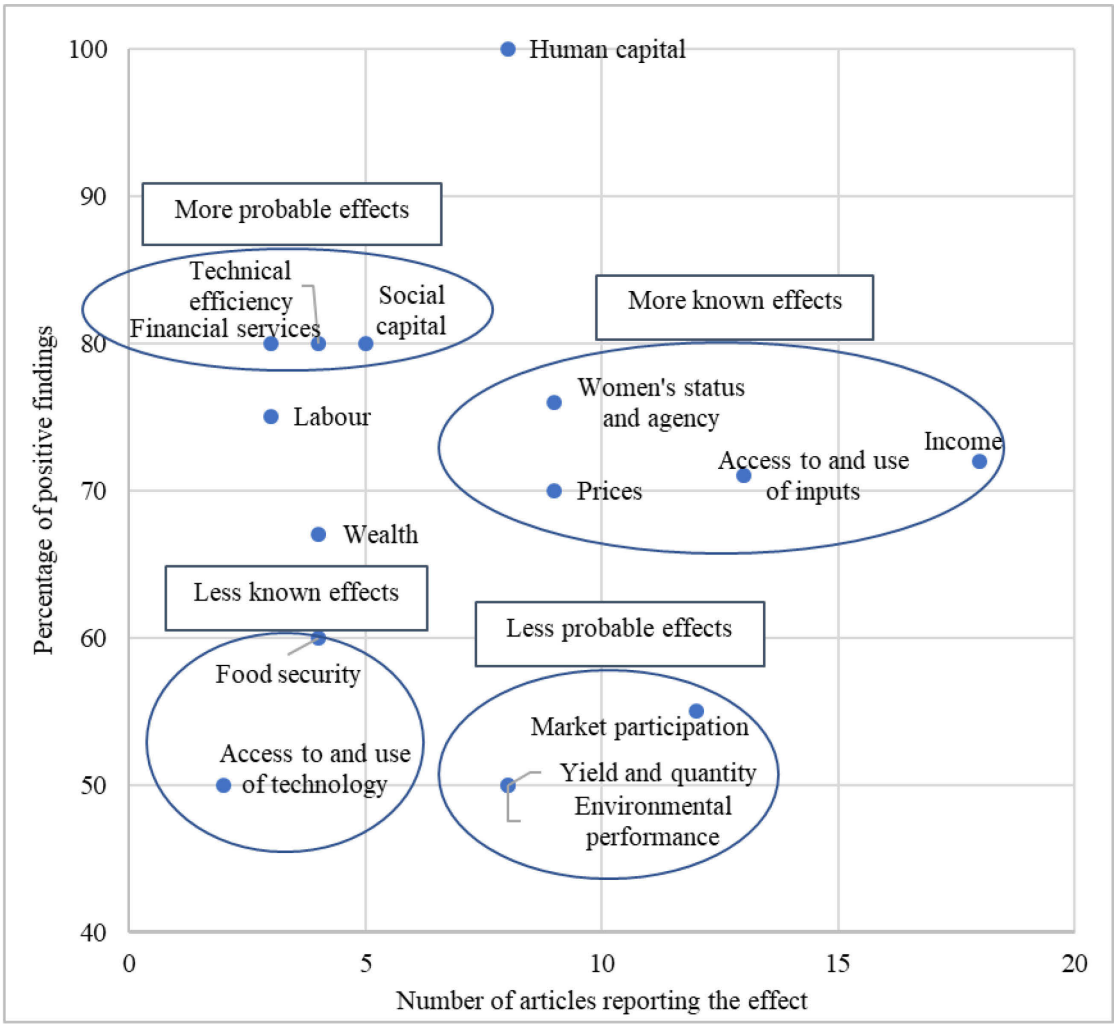

Figure 7: Cooperative effect categories, grouped according to number of reviewed articles reporting each effect and percentage of positive findings regarding them among articles exhibiting high and moderate levels of rigour (N=45)

Source: own graphic

In order to assess which of the identified factors can best explain cooperative effects, we contrasted the explanations for positive effects given by quantitative articles we deemed to have high levels of rigour (N=12) with our own conceptual framework:

- Effects found in 2 articles relate to the given institutional environment, more specifically, to access of cooperatives to governmental support programs, such as subsidised inputs or technological upgrades;
- Effects found in 5 articles relate to market and industry structure, with 2 articles highlighting how cooperatives increase farmer bargaining power and reduce transaction costs and the remaining 3 articles indicating that cooperatives enable farmer participation in value chains;
- Effects found in 3 articles relate to the governance model specific to cooperatives. In 2 articles, this model is said to enhance women's participation and leadership. In the remaining article, the model leads to higher levels of trust and trustworthiness; and
- Effects found in 3 articles relate to cooperative functions, with 2 of them specifying access to information and knowledge and the possibility of learning from peers being of importance. The remaining article highlights access to and use of inputs and technology provided by cooperatives.

2.5 Discussion and conclusions

In a context of renewed interest in promoting agricultural cooperatives as drivers for rural development and, simultaneously, a lack of conclusive evidence regarding what smallholders actually achieve by participating in them, we have undertaken a systemic literature review of 70 articles focused on cooperative effects on their members in developing countries. Although the articles analysed a wide variety of countries and agricultural sectors, we have found that a large share concentrated on a small set of countries and sectors. We have also found that cooperatives perform multiple functions – most including marketing – and many articles report that cooperatives receive external support, some from multiple organisations. Governments are the main support providers, generally initiating cooperatives and, to a lesser extent, supporting their regular activities as well.

Regarding differences between member and non-members characteristics, the evidence appears to remain inconclusive. While better-off farmers in terms of education, farm size, access to credit and income level are more likely to be cooperative members, this is not reported to hold for variables such as farm equipment, information and communication technology assets and access to extension services. Moreover, regardless of their membership, in most cases where analysis of clear data was possible for us, the farmers under study possessed less than 1 hectare of land. This means that, even though from a statistical perspective members' farms are relatively larger than those of non-members, from a socio-economic perspective they should all be considered very small or subsistence farmers. Lastly, concerning positive cooperative effects, for us the most conclusive evidence consists of the categories studied by at least 9 of the 43 most rigorous articles having positive effects and showing the greatest shares of positive results: access to and use of inputs, income, prices, and women's status and agency.

One limitation of the results presented here derives from our use of the vote-counting procedure. This procedure has been mainly criticised for only considering the direction of effects and not their magnitude while also failing to consider sampling error, with effects from smaller samples deviating more from population effects than those from larger samples (Haddaway et al., 2015; Waddington et al., 2012).

With the aim of building a comprehensive overview of the spectrum of cooperatives effects, we set up our review by posing a number of general research questions. Now, on the basis of our results, we believe that more sophisticated analysis could be plausible for specific effects but not for general effect categories that end up grouping different variables measured in different units, sometimes not easily homogenised.

Another possible limitation comes from the potential presence of publication bias, which usually derives from journal editors and researchers being reluctant to publish statistically non-significant results (Iyengar and Greenhouse, 1988). Consequently, significant results, both positive and negative, may be overrepresented. However, our review reports more statistically non-significant than negative results. Since donors support research and local universities or governments provide access to their data or collect the needed data, we believe that, in this field, there may be a greater bias towards not publishing negative results, which might deter further support, as compared to non-significant ones.

We conclude by first acknowledging that knowledge regarding cooperative effects has particularly increased in the last decade. However, it is still based upon only a relatively few examples. By addressing the wide variety among cooperatives in terms of sectors, functions and effects, among other potential areas of interest, researchers can now strive towards generating more detailed information about those items while also being more explicit about key factors such as external support. This would hopefully improve understanding of each case as well as add to our knowledge of the general mechanisms behind the effects. Furthermore, researchers could consider applying more dynamic approaches, such as panel analysis, and methodologically rigorous approaches. Lastly, the diversity of cooperative objectives and functions could be better addressed if researchers were to use a participatory approach when deciding upon their research focus (Bergold and Thomas, 2012); cooperative members and managers, for example, could help them establish what effects are most important for them. So far, articles in this field seem to have only pursued researchers' interests, which may not necessarily coincide with the preferences of those that are directly involved in cooperatives.

Since there are many theoretical reasons for cooperative failure – and cooperatives have failed many times – governments and donors should encourage analysis of negative results in order to better understand what can be improved. Moreover, the fact that cooperatives are less involved in activities such as providing access to credit and processing agricultural produce than they could be may indicate to governments that such services may need support by other means than through cooperatives themselves. All things considered, the evidence presented here recognises the positive effects of cooperatives, even though in some categories more than in others, which should give governments and donors reasons to be optimistic. Meanwhile, there are still meaningful shares of results where absence of evidence regarding cooperative effects should also lead them to be cautious.

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3 Empirical Study I (Paper two): Farm Gate Prices for Non-Varietal Wine in Argentina: A Multilevel Comparison of the Prices Paid by Cooperatives and Investor-Oriented Firms

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Published in *Journal of Agricultural & Food Industrial Organization*, DOI: 10.1515/jafio-2016-0036[4]

Abstract

In this paper, we use a unique data set of the prices paid to farmers in Argentina for grapes to examine the prices paid by non-varietal wine processing cooperatives and investor-oriented firms (IOFs). Motivated by contrasting theoretical predictions of cooperative price effects generated by the yardstick of competition and property rights theories, we apply a multilevel regression model to identify price differences at the transaction level and the departmental level. On average, farmers selling to cooperatives receive a 3.4% lower price than farmers selling to IOFs. However, we find cooperatives pay approximately 2.4% more in departments where cooperatives have larger market shares. We suggest that the inability of cooperatives to pay a price equal to or greater than the one paid by IOFs can be explained by the market structure for

non-varietal wine in Argentina. Specifically, there is evidence that cooperative members differ from other farmers in terms of size, assets and the cost of accessing the market. We conclude that the analysis of cooperative pricing cannot solely focus on the price differential between cooperatives and IOFs, but instead must consider other factors that are important to the members.

Keywords: Competitive yardstick; Pricing policies; Non-varietal wine; Mendoza; Argentina

3.1 Introduction

The difference in the ownership structure between a cooperative and an investor-oriented firm (IOF) has led to contrasting theoretical conclusions about the relative efficiency and competitiveness of cooperatives. On the one hand, it is argued that, because of their different objective function (which is typically assumed to be some version of service at cost or break even), cooperatives operate as a "competitive yardstick" and provide better prices in oligopsonistic environments. By operating without a margin, cooperatives force IOFs to increase their prices in order to retain business; the result is that prices increase for all farmers (Fulton and Giannakas, 2013; Giannakas and Fulton, 2005; Sexton, 1990). On the other hand, it is pointed out that cooperatives suffer from a series of property rights and governance/management problems that impede their efficiency and ability to operate efficiently (Chaddad and Cook, 2004; Cook, 1995; Hendrikse and Bijman, 2002; Hendrikse and Veerman, 2001; Staatz, 1987; Vitaliano, 1983). Cooperatives suffer from underinvestment caused by horizon problems that result from residual return rights that are non-transferable (Jensen and Meckling, 1979; Rey and Tirole, 2007; Vitaliano, 1983), and from free rider problems that result from residual returns being assigned to member-patrons and not investors (Caves and Petersen, 1986; Knoeber and Baumer, 1983). Unlimited delivery rights and the freedom to side-sell result in members treating their cooperatives as "markets of last resort" (Hart and Moore, 1996; Sexton and Iskow, 1988), while conflicting interests between members result in costly decision-making processes (Hansmann, 2009).

Taken together these two literatures suggest that if the problems related to collective ownership and management dominate, cooperatives may be unable to offer better prices. However, if advantages stemming from an alternative objective function dominate, cooperatives may acquire considerable market share and drive the market towards more competitive equilibria.

Viewed across space, the implication is that cooperative size and strength should be positively linked to higher relative prices offered by cooperatives vis-à-vis IOFs, and both features should be negatively associated with the degree to which cooperatives play the role of market of last resort.

In this paper, we use a unique data set of the prices paid to farmers by non-varietal wine processing cooperatives and IOFs in Argentina for grapes to examine three questions: (1) do cooperatives offer higher or lower prices to farmers compared to IOFs?, (2) do cooperatives induce higher prices for farmers in markets where they have greater market strength? and (3) do cooperatives offer lower prices when they play the role of market of last resort?

In the rest of the paper we review the pricing effects literature (section 3.2), explain the features of the Argentina case (section 3.3), describe our data set and introduce a multilevel regression model analysing various pricing effects (section 3.4), present the results (section 3.5), discuss the findings (section 3.6), and draw conclusions (section 3.7).

3.2 Literature on pricing effects

There are numerous factors that determine the prices paid by IOFs and cooperatives for agricultural products. Some relate to the decisions made by farmers when they sell their output, while others relate to the decisions made by the downstream purchasing firms. Due to imperfect information, producers may accept lower prices from one purchaser than another because they do not know the other buyers' willingness to pay (Sauer et al., 2012). When production is spatially distributed, producers may sell to the closest processor, even if the price is lower. This is particularly relevant for products that are highly perishable and costly to transport (Graubner et al., 2011). Farmers may also include other factors besides price in their sales decisions (Wills, 1985). For instance, when choosing a cooperative, farmers may take into account political representation (Staatz, 1987), market access or the right to unlimited delivery (i.e., a market of last resort). In times of rapid structural change, cooperative membership may secure delivery rights and be seen as a small farmer's way of ensuring against the hardships of structural change (Nilsson et al., 2016).

For processing firms, ownership structure may matter for pricing because farmer-owned processors are believed to have different objectives than IOFs. While IOFs are typically assumed to pursue profit maximisation, cooperatives, as user-owned organisations, may pursue

different objectives – one of the more common objectives is service at cost or break even.[5] Different objectives lead to different pricing policies and, depending on the market structure, to different market equilibria (Sexton and Lavoie, 2001).

Modern agricultural markets are increasingly characterised by a few concentrated input suppliers and a few buyers of agricultural products, which in turn can lead to less competitive prices (Sexton, 2013). For instance, an oligopsonistic market structure can be expected to lead to lower prices paid to farmers (McCorriston et al., 1998; Rogers and Sexton, 1994; Wann and Sexton, 1992). In this situation, it is argued that a cooperative buyer would offer producers more favourable prices because an objective to provide its members with service at cost. Competing IOFs must match the cooperative's price to avoid losing customers. The resulting equilibrium prices and quantities will depend on the relative average cost and marginal cost of the cooperative and IOF, respectively, with lower costs mapping onto higher prices and larger market shares (Fulton and Giannakas, 2013). This price enhancing effect is termed the competitive yardstick effect (Cotterill, 1987, 1997; Giannakas and Fulton, 2005; Liang and Hendrikse, 2015; Nourse, 1945; Sexton, 1990; Staatz, 1989). The yardstick effect may also be the consequence of strategic pricing and entry deterrence by IOFs as they raise prices to deter cooperative formation and market entry (Sexton and Sexton, 1987).

Several factors have been identified that may restrict the yardstick effect. For instance, a closed membership policy or the presence of large membership fees may mean that producers who are not cooperative members are unable to switch to the cooperative and benefit from the better prices it offers; in this situation, IOFs will not be under the same pressure to raise their prices (Cotterill, 1987; Sexton, 1990). Internal agency problems within the cooperative may also limit the yardstick effect (Fulton and Giannakas, 2013). In addition, because the yardstick effect affects all farmers, and not just cooperative members, it resembles a public good with the

[5] There is a substantial literature on the objective function of the cooperative. In-depth examinations of the various objective functions are found in Bateman et al., (1979), Levay (1983) and Sexton (1984). Among the objectives examined are the maximization of net earnings (similar to IOFs), the maximization of per-unit returns to farmers for product sold or the minimization of the per-unit price paid by members for goods or services purchased, the maximization of overall member returns (return from the cooperative plus farm-level profits), or the maximization of the volume transacted (inputs sold or produce purchased) to achieve economies of scale, reduce excess capacity, or increase market share. Sexton et al., (1989) provide evidence the cotton ginning cooperatives in California operate on a break-even basis that generates the greatest returns to farmers. Featherstone and Rahman (1996) provide support for the view that supply and marketing cooperatives in the U.S. midwest operate on a cost minimization basis; their results do not support the proposition that the cooperatives adhered to profit maximization. In contrast, Boyle (2004) finds that dairy cooperatives in Ireland operated as if they were profit maximizing.

accompanying free-rider problems that discourage farmers from becoming members or patronising the cooperative (Cotterill, 1987; Staatz, 1989).

The basic yardstick result is predicated on the cooperative and the IOF having similar costs. Yet, this may not be the case. There are at least two reasons why cooperatives might have higher costs than IOFs. First, it may cost cooperatives more to deal with their members than it does IOFs to deal with their suppliers – as Holloway (2000) note, the relative cost of carrying out a transaction depends on the producers from which a processing firm purchases, with different types of buyers giving rise to different costs and hence different prices. For example, the transaction costs of purchasing a given quantity and quality of product is generally lower for purchases from a small number of large-scale producers than from a large number of small-scale producers. Thus, cooperatives or IOFs serving small farmers may incur higher costs than if they were to purchase from larger farmers.

Second, costs are typically assumed to be higher in cooperatives because of the lack of well-defined property rights and the corresponding free rider problems, horizon problems, and portfolio problems. Weaker governance structures, due to the volunteer nature of boards, increased agency problems because of the inability to offer managers financial incentives that are linked closely to performance, and more costly decision making processes due to member heterogeneity may also lead to lower performance of cooperatives relative to IOFs (Chaddad and Cook, 2004; Chaddad and Iliopoulos, 2013; Cook, 1995; Fulton and Pohler, 2015; Hansmann, 2009; Hendrikse and Bijman, 2002; Hendrikse and Veerman, 2001; Vitaliano, 1983). To provide one example, differences in the expected membership period among members have been argued to give rise to the horizon problem in which only investments with short-term pay-offs are financed by the members (Giannakas et al., 2016), which in turn lowers the efficiency of the cooperative and raises its cost.

It should be noted that many if not most of the higher costs outlined above are the result of the specific ownership structure of the cooperative, which, in turn, is the source of the different objective function that the cooperative possesses. As a result, it is not possible to separate the cost issue from the yardstick effect – the structure required to generate a benefit (more competitive prices, the existence of a market of last resort) also creates a cost (higher operating expenditures).

The empirical evidence on the effect of cooperatives on prices is mixed. Milford (2012) and Hanisch et al. (2013) find a positive relationship between cooperative strength and farm gate prices, while Zavelberg and Storm (2016) find a partially positive relationship. In terms of comparative prices, some studies find that cooperatives pay more than IOFs (Cazzuffi, 2012; Shiferaw et al., 2008; Wollni and Zeller, 2007), some show that cooperatives pay less than IOFs (Hanisch et al., 2012), and other studies provide inconclusive results (Sauer et al., 2012). Table 6 summarises the main findings from the literature.

In this paper, the goal is to better understand the factors that influence cooperative pricing behaviour. To do this we examine the prices paid to individual farmers by cooperatives and IOFs in the wine industry in Argentina to determine if cooperatives offer higher or lower prices. We also investigate what happens to the price differential across different geographical regions and how the spatial price differences are linked to cooperative strength.

Table 6: Empirical literature on cooperative pricing in agricultural markets

Theoretical strand	**Authors /Year**	**Main assessment**	**Level**	**Data**	**Key result**
Price dispersion: Access to information	Courtois and Subervie (2015)	Seeks to understand how Market Information Service can lead to farmers receiving higher prices for their agricultural products	Individual (Farmer)	Survey of 400 beneficiaries of Market Information Service and 200 non beneficiaries in Ghana	Farmers who benefited from the Market Information Service received significantly higher prices for maize (10%) and groundnuts (7%) than farmers that did not benefit from the service
Price dispersion: Transaction costs	Royer (2011)	Assesses whether marketing boards and bilateral contracts decrease transaction costs faced by milk producers	Individual (Farmer)	Interviews and 62 surveys in Canada, England and Wales	The relative magnitude of transaction costs incurred by producers across settings is low, indicating that hybrid coordination mechanisms minimise transaction costs in the dairy sector
Price dispersion Uneven competition	Lewis (2008)	Examines price dispersion in the retail gasoline market	Individual (Consumer)	Recorded retail prices for 327 stations in the San Diego area (United States)	Price dispersion is prevalent after controlling for differences in stations' average

					price levels and is sensitive to the number and nature of local competitors
Price dispersion: Access to information and Firm ownership	Wollni and Zeller (2007)	Determines the factors that influence participation in specialised markets and whether participation in these markets and in cooperatives leads to higher prices for coffee farmers	Individual (Household)	Survey of 216 randomly sampled households in two major coffee regions in Costa Rica	Access to information about world market prices leads to an increase of 0.03 US$/lb in producer prices on average. Marketing through cooperatives increases the average price obtained by 0.05 US$/lb
Price dispersion: Firm ownership	Shiferaw et al. (2008)	Identifies the potential and limitations of rural institutions in providing market services for small scale producers	Individual (Household)	Survey of 400 households comprising 250 members and 150 non-members of Producer Marketing Groups in Kenya	Prices paid by Producer Marketing Groups to the member farmers are 22 to 24% higher than the prices paid by middlemen. This gain comes at a cost of delayed payments to grain sellers
Price dispersion: Firm ownership	Sauer et al. (2012)	Identifies the determinants of variations in farm gate milk prices	Individual (Farmer)	300 responses per country in Armenia, Ukraine and Moldova	A 1% rise in the quantity of milk sold through a marketing cooperative is associated with increases of 0.2% and 0.1% in farm-gate milk prices in Armenia and Ukraine. No significant effect in Moldova
Price dispersion: Firm ownership	Cazzuffi (2012)	Assesses if the organisational form has an effect on farm gate price	Individual (Farmer)	Survey of 313 farmers in 3 regions of Italy	Cooperative members receive 5.5% higher prices than prices paid by IOFs
Price dispersion: Firm ownership	Hanisch et al. (2012)	Provides a comprehensive description of the current level of development of cooperatives and other producer organisations in the dairy sector	National	Data from 498 producer prices for large Western European Dairies from 2008 to 2012 provided by EMB and Eurostat	In 75% of the observations the cooperative-IOF price difference is negative. When standardised by country, and assuming a milk price of 30 Euros/100 kg, cooperatives pay

					on average 10% less than IOFs
Yardstick effect	Hanisch et al. (2013)	Estimates the effect of cooperatives' market share on farm gate milk prices	National	Eurostat panel data on farm gate milk prices, maize fodder prices, per capita GDP, and trade balances from 2000 to 2010 for the EU-27	A 1% increase in the market share of cooperatives leads to a rise in the farm gate milk price of 2.5 Eurocents cents per 100 kg milk
Yardstick effect	Milford (2012)	Investigates if Fairtrade and organically certified coffee cooperatives have a pro-competitive effect	Municipal	50 semi-structured interviews with cooperative members and managers, coffee purchasers, government officials, researchers and other stakeholders, plus coffee price data for 75 municipalities in Mexico	Most cooperatives (74%) think they have a stronger effect on the cheating behaviour than on the pricing behaviour of the intermediaries (50%). An increase in cooperative presence by one cooperative for every 100 farmers leads to a 5.3% increase in the local price
Price dispersion: Firm ownership and yardstick effect	Zavelberg and Storm (2016)	Evaluates the effects of space and legal form on pricing behaviour of dairy processors	Individual (Buyer)	Data from all German dairies from 2001 to 2012 provides information on raw milk prices, processing quantities, legal and production form (N = 1645, divided by north and south region)	Cooperatives pay 0.65 Euro cent per kilo less than IOFs in the north. In the south the effect is statistically not significantly different form zero. There is little evidence of the competitive yardstick effect (only in the south)
Price dispersion: Firm ownership	Cazzuffi (2012)	Assesses if the organisational form has an effect on farm gate price	Individual (Farmer)	Survey of 313 farmers in 3 regions of Italy	Cooperative members receive 5.5% higher prices than prices paid by IOFs
Price dispersion: Firm ownership	Hanisch et al. (2012)	Provides a comprehensive description of the current level of development of cooperatives and other producer organisations in the dairy sector	National	Data from 498 producer prices for large Western European Dairies from 2008 to 2012 provided by EMB and Eurostat	In 75% of the observations the cooperative-IOF price difference is negative. When standardised by country, and assuming a milk price of 30 Euros/100

	kg, cooperatives pay on average 10% less than IOFs

Source: own compilation

3.3 The non-varietal wine market in Mendoza

Argentina has a long tradition of grape production and wine making. In 2013, Argentina was the eighth largest grape producing country in the world, the fifth largest wine producer, and the ninth largest exporter (International Organisation of Vine and Wine, 2015). The province of Mendoza accounts for 66% of all the vineyards and for 76% of Argentina's national wine production.

Mendoza is characterised by the coexistence of small-scale vineyards (*minifundios*) and large-scale vineyards. In 2011, 77% of the province's vineyards (12,634) had 10 or less hectares and accounted for 31% of the area. At the other extreme, 2.6% of all vineyards (427) had 50 hectares or more and represented 26% of the provincial planted surface (National Institute of Viticulture, 2011). This farm size distribution is the result of, on the one hand, the subdivision of vineyards due to inheritance and, on the other hand, the consolidation of farms as larger producers buy out smaller producers.

The distribution of vineyard size has also been affected by the trend to produce higher oenological quality grapes for varietal wines; indeed, the structural adjustment policies introduced since the 1990s to deal with this shift have resulted in the loss of 11,200 vineyards since 1980 (National Institute of Viticulture, 2011).[6] Nevertheless, while domestic per capita consumption of non-varietal wine (or generic/table wine) has decreased over the past 30 years, it is still popular and the cooperative system plays a significant role in this market segment.

From the 1950s until the mid-1970s, the state supported the organisation of cooperatives (Fabre, 2005; Richard-Jorba, 2008). National policies sought to professionalise cooperative management and develop the technical capabilities of cooperative managers. In 1990, the state-owned winery Bodegas y Viñedos Giol was privatised and taken over by the Argentinean

[6] The main fine grapes constituted 49% of total grape production in 2012, compared to 36% for the main common grapes.

Federation of Wine Making Cooperatives (FeCoVitA). In 2010, cooperatives processed 20% of the province's grape production through 41 first level cooperatives, with 29 of them associated with FeCoVitA. Around 3,000 members and 2,000 non-members deliver grapes to cooperatives to produce non-varietal wine. Overall, grape producers linked to the cooperative system represent 33% of the total grape producers in the province.

Non-varietal wine is regarded as a homogenous good, with little price and quality differentiation (Day; Fielden, 2003). Its supply chain in Mendoza is structured as follows. At the first stage, grape producers sell their produce to wineries, which then often trade wine among themselves to later sell to bottling and wholesale firms. These firms, in turn, sell the wine to the retailers. Besides cooperatives, there are other integration structures – some wineries own vineyards, while some bottling firms own wineries and buy directly from grape producers. In 2004, there were over 500 wineries; of these approximately 40 medium size wineries bottled wine, while more than 450 delivered the wine to either medium size wineries or to the five largest firms which control 75% of the non-varietal wine (Azpiazu and Basualdo, 2003; Musri Arias, 2018).

Since it is a mature industry, there are no significant technological differences among wineries. However, the scale of the winery may be a differentiating factor, with larger wineries having lower costs per litre transacted. Over time, concentration levels in the bottling phase have increased. In 2014, the three largest firms were: Peñaflor (25% of the market), FeCoVitA (23%), and RPB (15%) (El Sol, 2014). Each firm has its own labels; they also produce must and varietal wine.

3.4 Data and Methodology

In our analysis of the prices received by growers from cooperatives and IOFs, we consider 5,042 records of the sale of bulk non-varietal wine registered with the Chamber of Commerce of Mendoza during the period 2007–2012. The volume of all the transactions registered represented 25.5% of the total wine produced in the province in the studied period. Although the registration of operations and sales is mandatory by law, and despite penalties for non-compliance, not all transactions are registered. The transactions cover the sale of grapes by a grape producer (seller) and a cooperative or IOF (buyer) in the first stage of the supply chain. Although producers deliver grapes, price and quantity are recorded in terms of the type and quantity of the wine that is produced.

Wine cooperatives in Mendoza generally retain any surplus that is earned and consider it as members' contributions or symbolic fees that can be used to finance investments. Thus, there is no refund in cash distributed to members, and the prices paid by IOFs and cooperatives are comparable. In Mendoza, members are not obliged to deliver their production to the cooperative or to remain members of the cooperative for a specific period. Thus, farmers may use the cooperative as the market channel of last resort, and they may choose to deliver to whichever firm (cooperative or IOF) offers the best deal (however that is defined for each producer).

Each transaction is characterised by its departmental location (the department is a political division of the province) and year. As will be discussed later, organising the data in this way allows the use of a multilevel empirical model to account for different levels of aggregation in the data. According to the location of the wineries (buyers), transactions are distributed over 11 departments, which accounted for 72% of the provincial grape production in 2012.[7] Agricultural production in Mendoza is concentrated in a very small portion of the province (4% of the province's surface area or 148,827 square kilometres). This area contains a well-established irrigation system and is where most of the province's population and economic activities are concentrated. Given the geographical proximity of grape production, transportation costs play a limited role.

Grouping transactions by departments allows for a consideration of differences in prices that may be explained by departmental characteristics such as micro-climatic conditions, local weather variations or local patterns of behaviour. Grouping transactions by year controls for inter-temporal changes such as weather.

Producer prices were deflated using the Wholesale Price Index for wine and cider provided by the Argentinean Ministry of Economics. Real prices were transformed to logarithms to improve distributional properties. December 2006 was used as the baseline when price changes were calculated.

At the transaction level, a number of factors can influence the price paid. Colour is important, with red non-varietal wine sold at higher prices than white wine. The presence of substitutes is a significant factor. Grapes can be used to produce must or wine. Must is the freshly pressed grape juice and can be used to produce grape juice or as a sweetener of other fruit juices. If

[7] Mendoza is divided into 18 departments; 14 of these produce grape and wine. Departments with a very small number of registered transactions were excluded from the analysis.

must is fermented it becomes wine. Although must can also be stocked and later used to produce wine, this is forbidden by law in Argentina. Therefore, since it acts as a substitute market, the price for must can be expected to affect the price of wine.

Buyer characteristics may also affect the price. For instance, buyers with a brand could be more likely to bottle the wine and sell it to consumers; they may be willing to pay higher prices because they bear less intermediation costs. The volume handed by the winery may also affect the cost of production and hence the price that is paid. To capture this effect, we included a dummy variable to account for different sizes of the wineries (large, medium and small). We estimated the winery size according to its average volume purchased per year of non-varietal wine. Since not all volume transacted is registered, we used a dummy and not a continuous variable for size to control for the potential bias of non-registered transactions in estimating the size of a winery.

The scale of grape production can be expected to affect the price paid for grapes, with the presence of smaller producers associated with higher costs and hence a lower price paid. The presence of smaller producers would lead to higher costs if it were assumed that the cost of arranging a transaction is roughly the same regardless of the size of the transaction; in this case dealing with lots of smaller producers results in higher overall costs. This grape production scale factor was captured by a variable representing the share of farmers in each department with less than 5 hectares.

The number of wineries in a department may also affect the price paid through competition. To capture this factor, the number of wineries per department was included as an explanatory variable.

In addition, the price paid by cooperatives in a department is expected to be associated positively with cooperative strength in that department. Larger cooperatives may have lower costs because of economies of scale, and thus are able to offer better prices. And, as discussed above, larger cooperatives emerge when farmers find their prices and services relatively attractive. The cooperative strength at the department level was calculated in three different ways – as the share of the surface area cultivated by members of the cooperatives, as the share of the grapes handled by cooperatives, and as the share of the wine handled by cooperatives. These statistics were computed using provincial statistics and cooperative balance sheet information for 39 out of the 49 cooperatives registered in 2012 (General Department of

Cooperatives, 2016). As Table 7 indicates, the strength of cooperatives shows significant variability; cooperatives are absent in some departments whereas in others they handle around 50% of the market. Moreover, the number of firms that engaged in transactions also show significant variability across departments (from 3 to 59). Although the average number of firms performing transactions per department (21.2) suggests the presence of many buyers, the percentage of transactions accounted for by the top five buyers (from 59% to 100%) indicates a high degree of concentration in many departments.[8]

[8] San Carlos department shows a much higher share of grapes and wine handled by cooperatives than the share of the surface of the cooperatives' members. This difference is a reflection of the fact that cooperatives in this department buy large quantities of grapes and wine from non-members.

Table 7: IOFs and cooperative strength, number of transactions and firms by department

Department	Average Cooperative Share			Transactions			Number Firms			Transactions top 5 Firms (%)
	Surface	Grapes	Wine	IOFs	Coop	Total	IOF	Coop	Total	
	(%)			(Number)			(Number)			
General Alvear	37.8	44	53.2	43	97	140	5	3	8	98
Junín	8.5	17.8	8.5	324	179	503	18	3	21	73
Luján de Cuyo	0	0	0	91		91	19	0	19	66
Maipú	4.1	3	2.7	779	5	784	34	1	35	72
Rivadavia	4.3	8.3	3.7	504	64	568	32	1	33	64
San Carlos	9.7	33.5	50.9	15	101	116	3	1	4	100
San Martín	9.5	10.9	10.6	1,652	115	1,767	56	3	59	45
San Rafael	34.4	29.9	26.3	677	59	736	31	2	33	57
Santa Rosa	3.6	5.7	5.5	233	51	284	10	1	11	92
Tunuyán	3.5	6.3	8.5	16	12	28	2	1	3	100
Tupungato	0	0	0	23	2	25	7	1	8	88
Total				**4,357**	**685**	**5,042**	**217**	**17**	**234**	

Source: own calculations, based on General Department of Cooperatives and National Institute of Vititculture

Table 8 provides a summary of the variables discussed above. Since the last three variables in the table correlate strongly (the Pearson correlation coefficients between *COOPSHARE SURFACE* and *COOPSHARE GRAPES*, *COOPSHARE SURFACE* and *COOPSHARE WINE*, and *COOPSHARE GRAPES* and *COOPSHARE WINE* are 0.83, 0.72, and 0.92, respectively), we introduce each of them separately into the regressions.

Since departments and years are overlapping groups, the crossed-effects multilevel regression model for a transaction *i* in year *t* and department *k* can be written as:

$$\begin{aligned} LNPRICE_{itk} &= \beta_1 + \beta_2 MUSTPRICE_{tk} + \beta_3 RED_{itk} + \beta_4 BRAND_{itk} + \beta_5 WINERIES_k + \\ &\beta_6 SMALLFARMS_k + \beta_7 MEDIUMFIRM_k + \beta_8 SMALLFIRM_k + \beta_9 COOPBUYER_{itk} + \\ &\beta_{10} COOPSHARE_{tk} + \beta_{11} COOPBUYER_{itk} * COOPSHARE_{tk} + \zeta_{1t} + \zeta_{2k} + \zeta_{3tk} + \varepsilon_{itk} \end{aligned} \quad (1)$$

where the betas are the coefficients to be estimated. The terms ζ_{1t}, ζ_{2k} and ζ_{3tk} are random intercepts for year, department, and the interaction between year and department; they are assumed to be normally distributed with a zero mean, variance ψ_t, ψ_k and ψ_{tk}, respectively, and each of them is assumed to be uncorrelated across groups. The term ε_{itk} is the residual at the transaction level, with a zero population mean, constant variance θ, interpretable as the within transaction variance, and is uncorrelated across transactions, years and departments.

By introducing a dummy variable (*COOPBUYER*), the price difference between cooperatives and IOFs can be examined; the coefficient on this variable will be positive if the cooperative offers a higher price than the IOF. In addition, to test the existence of a yardstick effect, the strength of cooperatives in each department (*COOPSHARE*) is introduced. The coefficient of this variable is positive when a larger cooperative share (of surface, grapes, or wine, depending on the specification) is associated with higher prices paid in the department. An interaction term between *COOPBUYER* and *COOPSHARE* is included to examine if the price differential between the cooperative and the IOF is influenced by cooperative strength.

Table 8: Variable description and summary statistics

Variable	Description	N	Mean	SD	Min	Max
Ln price	Natural logarithm of real producer price of non-varietal wine per hectolitre	5,042	4.43	0.42	2.59	5.91
Must price	Average real monthly producer price of must per hectolitre	66	41.5	6.87	30.55	57.04
Red	= 1 if wine colour is red	5,042	0.49	n.a.	0	1
Brand	= 1 if buyer has a brand	5,042	0.78	n.a.	0	1
Wineries	Number of wineries in the department	11	75.54	50.99	22	165
Small farms	Percentage of vineyards with 5 or less hectares in the department	11	16.41	15.19	3.26	55.46
Medium firm	= 1 if the firm size is medium	5,042	0.47	n.a.	0	1
Small firm	= 1 if the firm size is small	5,042	0.14	n.a.	0	1
Coop buyer	= 1 if the buyer of the transaction is a cooperative	5,042	0.13	n.a.	0	1
Coop share surface	Cooperatives' departmental share of surface	66	10.5	12.71	0	46.96
Coop share grapes	Cooperatives' departmental share of grapes	66	14.49	14.7	0	50.58
Coop share wine	Cooperatives' departmental share of wine	66	15.45	19.03	0	60.76

Source: own calculations

3.5 Results

The analysis begins with an examination of an ordinary least squares (OLS) regression; this is then followed by an examination of a crossed-effects multilevel (ML) regression with random intercepts for 6 years and 11 departments. We use OLS regressions as a benchmark to see how ML regressions improve the analysis by considering the different levels of data aggregation (Robson and Pevalin, 2016). Running a multilevel regression without covariates and year as the only level variable explains 21.43% of the variance encountered in the dependent variable (natural logarithm of the real price of wine), while department as the only level variable explains 17.12%. Since both variables explain significant shares of the variance, they are suitable as levels. Table 9 shows estimates for the OLS and the multilevel regressions, each with the three different specifications of cooperative strength: the share of surface cultivated, the share of grapes produced, and the share of wine produced by cooperatives, respectively.

Table 9: Estimation results of OLS and ML crossed-effects regressions

Variable	Cooperative Strength – Surface		Cooperative Strength – Grapes		Cooperative Strength – Wine	
	OLS	**ML**	**OLS**	**ML**	**OLS**	**ML**
Must price	-0.0003	0.0122***	-0.0001	0.0121***	-0.0001	0.0122***
	(0.0006)	(0.0010)	(0.0006)	(0.0010)	(0.0006)	(0.0010)
Red	0.4579***	0.4429***	0.4609***	0.4430***	0.4616***	0.4433***
	(0.0097)	(0.0078)	(0.0097)	(0.0078)	(0.0097)	(0.0078)
Brand	0.0910***	0.0644***	0.1033***	0.0652***	0.0997***	0.0643***
	(0.0116)	(0.0100)	(0.0117)	(0.0100)	(0.0117)	(0.0100)
Wineries	-0.0009***	-0.0009	-0.0006***	-0.0009	-0.0006***	-0.0009
	(0.0001)	(0.0006)	(0.0001)	(0.0006)	(0.0001)	(0.0007)
Small farms	-0.0118***	-0.0059	-0.0077***	-0.0065**	-0.0047***	-0.0063**
	(0.0013)	(0.0043)	(0.0011)	(0.0029)	(0.0009)	(0.0027)
Medium firm	-0.0656***	-0.0366***	-0.0611***(	-0.0370***	-0.0573***	-0.0366***
	(0.0104)	(0.0093)	0.0105)	(0.0093)	(0.0106)	(0.0093)
Small firm	-0.1000***	-0.0958***	-0.0768***(	-0.0921***	-0.0785***	-0.0940***
	(0.0176)	(0.0129)	0.0172)	(0.0130)	(0.0173)	(0.0130)
Coop buyer	-0.1054***	-0.0748***	-0.1595***(	-0.1064***	-0.0980***	-0.0636***
	(0.0211)	(0.0200)	0.0242)	(0.0239)	(0.0201)	(0.0192)
Coop share surface	0.0060***	-0.0020				
	(0.0010)	(0.0047)				
Coop buyer x Coop share surface	0.0048***	0.0027**				
	(0.0012)	(0.0011)				
Coop share grapes			0.0028**(0	-0.0016		
			.0011)	(0.0027)		
Coop buyer x Coop share grapes			0.0048***	0.0039***		
			(0.0011)	(0.0011)		
Coop share wine					0.0001	-0.0011
					(0.0010)	(0.0022)
Coop buyer x Coop share wine					0.0021**	0.0016*
					(0.0010)	(0.0009)
Constant	4.4317***	3.9620***	4.3352***	3.9611***	4.3223***	3.9559***
	(0.0422)	(0.1269)	(0.0384)	(0.1253)	(0.0389)	(0.1282)
Random intercept year (ζ_{1t})		0.2285***		0.2288***		0.2290***
		(0.0672)		(0.0672)		(0.0673)
Random intercept department (ζ_{2k})		0.0938***		0.0860***		0.0896***
		(0.0272)		(0.0244)		(0.0291)
Interaction between year & department (ζ_{3tk})		0.0799***		0.0794***		0.0823***
		(0.0153)		(0.0149)		(0.0161)
ε_{itk}		0.2662***		0.2661***		0.2662***
		(0.0027)		(0.0027)		(0.0027)
N	5,042	5,042	5,042	5,042	5,042	5,042
R^2	0.353		0.351		0.348	
X^2		2262.8		2280.1		2297.5
Log likelihood	-1688.6	-557.2	-1694.4	-554.4	-1707.3	-558.5
AIC	3399.2	1144.4	3410.9	1138.8	3436.6	1147.0
BIC	3471.0	1242.2	3482.7	1236.6	3508.4	1244.9

* Significant at= 0.10, ** significant at=0.05, *** significant at= 0.01

Note: Standard errors in parentheses

Source: own calculations

The X^2 indicates that a likelihood ratio test comparing the ML with its respective OLS regression confirms the existence of level effects in the data. Hence, the ML regression model is preferred over the OLS. The Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) values for the ML regressions are less than those for the OLS regressions, indicating that the ML model has a better fit.[9] The Intra Class Correlation (ICC), which is the percentage of the variance in each ML regression that is explained by the levels, confirms that the use of levels is appropriate. Table 10 shows the values for each ML regression and level, with differences between years explaining around 38% of the variance in each ML specification.

Following Rabe-Hesketh and Skrondal (2012), we calculated the coefficient of determination (R^2) between the null ML (including no covariates) and the full ML (including all covariates). The coefficient indicates that 31.5% of the variance is explained by the covariates in the ML regression considering the share of surface, and 32.1% and 31.5% in the cases of the share of grapes and wine, respectively.[10]

The estimated coefficients of the control variables in the ML regressions have the expected signs: a one-unit increase in the price of must causes a 1.2% increase in the price of wine. A

[9] The analysis of the residuals indicates that the error term is normally distributed and homoscedastic. Regarding spatial autocorrelation, we calculated the Moran I test to see if prices paid in one location are related to prices paid in another location. We can only localize our data in 11 departments. Because we do not have geographical information for each transaction, the tests are rather limited in their applicability. Running a spatial regression would require geo references for the data. Correlation of errors between neighbouring departments will not bias estimates in the multilevel regression which introduces random intercepts for each department.

[10] The subscript 0 indicates the null ML regression (without covariates) and the subscript 1 indicates the full ML regression (with covariates).

$$R^2 = \left[(\bar{\Psi}_{t0} + \bar{\Psi}_{k0} + \bar{\Psi}_{tk0} + \bar{\theta}_0) - (\bar{\Psi}_{t1} + \bar{\Psi}_{k1} + \bar{\Psi}_{tk1} + \bar{\theta}_1)\right] / (\bar{\Psi}_{t0} + \bar{\Psi}_{k0} + \bar{\Psi}_{tk0} + \bar{\theta}_0) \qquad (2)$$

$$R^2_{MLMSURFACE} = \frac{\left[(0.2082^2 + 0.1798^2 + 0.0721^2 + 0.3477^2) - (0.2285^2 + 0.0938^2 + 0.0799^2 + 0.2662^2)\right]}{(0.2082^2 + 0.1798^2 + 0.07241^2 + 0.3477^2)} = 0.3149$$

$$R^2_{MLMGRAPES} = \frac{\left[(0.2082^2 + 0.1798^2 + 0.0721^2 + 0.3477^2) - (0.2288^2 + 0.0866^2 + 0.079^2 + 0.2661^2)\right]}{(0.2082^2 + 0.1798^2 + 0.07241^2 + 0.3477^2)} = 0.3218$$

$$R^2_{MLMWINE} = \frac{\left[(0.2082^2 + 0.1798^2 + 0.0721^2 + 0.3477^2) - (0.229^2 + 0.0896^2 + 0.0823^2 + 0.2662^2)\right]}{(0.2082^2 + 0.1798^2 + 0.07241^2 + 0.3477^2)} = 0.3156$$

one-unit increase in the percentage of farmers with 5 or less hectares causes a 0.63% decrease in the price of wine (in two out of the three specifications). Red wine is approximately 55% more expensive than white wine. Lastly, as expected, large wineries pay higher prices than medium and small wineries, and wineries with a brand pay higher prices than wineries without a brand.

Table 10: Intra Class Correlation for each level variable for different cooperative strength measures

Level	Cooperative strength measure		
	Surface	**Grapes**	**Wine**
Shared of the variance explained by differences between years	37.7%	38.2%	38%
Shared of the variance explained by differences between departments	6.3%	5.4%	5.8%
Shared of the variance explained by differences between years and departments	4.6%	4.6%	4.9%

Source: own calculations

The coefficient on the variable *COOPBUYER* is negative and statistically significantly different from zero at the 0.01 significance level, indicating that on average the price offered by cooperatives is less than that offered by IOFs. The coefficient on the variable *COOPSHARE* in the ML regressions is negative, but not statistically significant, suggesting the increased presence of cooperatives in a department does not have an effect on the price paid in that department. The interaction term *COOPBUYER x COOPSHARE* is positive and statistically significant in the three specifications.

Taken together, these results indicate that on average cooperatives pay a lower price than IOFs, but that the size of this discount falls as cooperative strength increases. As Table 11 shows, the predicted average price differential in 2007 for the three measures of cooperative strength (surface, grapes and wine) are -3.85%, -3.54% and -2.99%, respectively.[11] The average, however, masks considerable variance across departments. Using the cooperative share of grape production as the measure of cooperative strength, and examining the case in 2007, the predicted price differential ranges from a low of -9.27% for Santa Rosa where cooperative strength is 2.49% to 7.74% for the department of General Alvear where cooperative strength is 45.55%. When the other two measures of cooperative strength are used, the results are qualitatively similar. The results are also qualitatively similar for the other years. When

[11] Calculations are available from the authors upon request.

averaged over all years and departments, as well as across the three cooperative strength measures, the predicted price differential between cooperatives and IOFs is -3.37%. In the case of San Rafael and General Alvear, the only departments with a positive price differential between cooperatives and IOFs, the predicted average price difference is 2.4%.

Table 11: Predicted average net price differentials by department using different cooperative strength measures, 2007

Department	Cooperative Strength–Surface		Cooperative Strength–Grapes		Cooperative Strength–Wine	
	Share in 2007	Estimated price differential	Share in 2007	Estimated price differential	Share in 2007	Estimated price differential
	(%)					
Luján de Cuyo	0	-	0	-	0	-
Tupungato	0	-	0	-	0	-
Santa Rosa	3.21	-6.49	2.49	-9.27	3.13	-5.8
Tunuyán	3.33	-6.36	9.28	-6.51	10.45	-4.54
Maipú	4	-6.07	4.14	-8.42	4.01	-5.46
Rivadavia	4.19	-6.17	6.28	-7.73	4.17	-5.58
Junín	6.85	-5.42	14.22	-4.59	7.94	-4.95
San Martín	9.52	-4.65	14.11	-4.6	15.46	-3.7
San Carlos	11.61	-4.05	25.84	0	56.15	2.82
San Rafael	34.5	2.18	29.53	1.5	27.94	-1.65
General Alvear	35.2	2.34	45.55	7.74	50.37	1.95
Average		-3.85		-3.54		-2.99
Minimum		-6.49		-9.27		-5.8
Maximum		2.34		7.74		2.82

Source: own calculations

It is important to note that the recorded transaction data does not include information on the level of sugar or acidity, which means it is not possible to determine if these factors influence the price that is paid. However, as was discussed earlier, non-varietal wine is an inexpensive wine made with low oenological quality grapes. Therefore, it can be considered a homogenous good for which quality differentials do not play an important role.

3.6 Discussion

The results of the analysis show that, first, cooperatives on average pay lower prices than IOFs and, second, the price differential between cooperatives and IOFs in a department depends importantly on the strength of the cooperatives. Regardless of how cooperative strength is measured, the larger is the presence of cooperatives in a department, the more likely it is that cooperatives pay a higher price than IOFs. These results have implications for understanding why growers sell to cooperatives and whether cooperatives offer a yardstick of competition. We examine the second of these two points first.

As shown in Table 11, the stronger is the presence and strength of cooperatives in a department, the smaller is the discount in the price paid by cooperatives. In fact, when the cooperative strength is large enough (the data suggest a dividing line at about 30%), the cooperative offers a premium over the IOF. One of the inferences from this result is that cooperatives can provide a positive price differential compared to IOFs, as long as they are able to overcome their property rights and governance problems sufficiently to lower costs, thus allowing them to operate more competitively and to expand their operations.

It is important to note that the regression results indicate that while a sufficiently high cooperative strength will lead to a premium over the IOF price, it does not lead to higher IOF prices. Thus, cooperatives effectively only offer a price premium to the growers that sell them their produce; this premium does not extend to the growers that sell their product to the IOFs.

Regarding the first point, although cooperatives offer lower prices than IOFs in many of the departments, it does not follow that removing cooperatives from these markets would result in better prices for all farmers. Two remarks are relevant here. First, even if cooperatives do not offer prices as high as those offered by IOFs, their presence can nevertheless enhance competition and result in prices higher than what would otherwise be the case. This outcome can be observed in the data presented in Table 11, where decreasing shares of cooperatives' strength result in even larger price discounts relative to IOFs. More data and analysis, however, would be required to analyse prices paid in the total absence of cooperatives in detail.

Second, it is clear that, even though cooperatives are offering lower prices than the IOFs, growers are still patronising them. Thus, cooperatives must be offering some value to producers. As mentioned earlier, producers' selling decisions may be influenced by other factors besides

price, such as the services offered by cooperatives. In the case of Mendoza province, these services might include political representation through FeCoVitA and access to extension services.

There is also evidence that cooperatives fulfil different functions and serve different producers than their IOF counterparts. In particular, there is some support in the data for the argument that wine cooperatives serve as the market of last resort for many producers. In ten out of the eleven departments analysed, the vineyard size of the cooperatives' members is considerably smaller than the average size of producers in the department. On average, a cooperative member's vineyard size is 6.8 hectares, while an average producer's vineyard is 10.2 hectares. In addition, the average volume of a cooperative's purchase is 25% smaller than the average firm's purchase.

Wine cooperatives in Mendoza may help farmers withstand rapid structural change. One of the pieces of evidence for this conclusion is that cooperatives are more prominent in zones where production is declining. Specifically, cooperatives' share of the surface area is greatest in departments that have seen the largest drops in grape production. Between 1985 and 2012, San Rafael and General Alvear, two of the departments with the highest cooperative strength, have decreased their share of the provincial planted surface by 48% and 57%, respectively (National Institute of Viticulture, 2016). In addition, both departments have the smallest average farm size in the province (National Institute of Viticulture, 2016). In contrast, cooperative strength is very small in the two departments (Tunuyán and Tupungato) that have nearly tripled their planted surface over the same period.

Cooperatives may also be the markets of last resort for low capital, part-time farmers or farmers close to retirement. In 2009, a survey of 663 members of the cooperatives associated with FeCoVitA indicated that 38% were older than 60 years and 42% had trellises (productive infrastructure) in regular or bad state; aging vineyards were also mentioned as a major problem (Neiman et al., 2009). This data suggests that many of the members cannot afford to maintain their productive infrastructure; one reason might be the comparatively high maintenance costs relative to vineyard scale. Small-scale grower operations that use the cooperative as the market of last resort directly affect the performance of the cooperative, making it costlier to run. Moreover, the unlimited delivery rights enjoyed by members may lead cooperatives to handle higher volumes than optimal from time to time, or to be subject to large production swings, making their operations less efficient. For these reasons, cooperatives may not fulfil the same

functions as their investor-oriented counterparts, which in turn could at least partly explain their persistence despite the lower prices they pay.

If cooperatives have higher costs, due to the smaller size of the producers with which they deal, it limits their ability to pay a higher price. In such a situation, it might be expected that in equilibrium only those farmers that are willing to accept a lower price would deal with cooperatives, which in turn results in higher costs for the cooperative and less ability to pay higher prices. The finding in the regressions that an increase in the percentage of small-scale farmers in a department is associated with lower prices is consistent with this argument.

Acknowledging that a third of the producers in the province continue to deliver to cooperatives even though they pay lower prices leads us to reconsider the role of the cooperative system in Mendoza. Our findings, for instance, shed light on the role of cooperatives as a defensive means for small scale-farmers to deal with the hardships of ongoing structural change in the wine sector. In this vein, cooperatives may represent a way to stay in the non-varietal wine market and provide farmers with political representation, albeit at the cost of a lower price received.

3.7 Conclusions

In this paper, we analysed cooperative pricing in the Argentinean wine industry. Motivated by contrasting theoretical predictions of cooperative price effects, we applied a multilevel regression model to identify price differences at the transaction level and the departmental level. We found that across most of the departments in Mendoza, cooperatives pay less to farmers than IOFs. Cooperatives have larger market shares in departments with declining grape production, and cooperative members have smaller farms than the average.

We suggest that the inability of cooperatives to pay a price equal to or greater than that paid by the IOFs can be explained by the market structure for non-varietal wine in Argentina. Specifically, there is evidence that cooperative members differ from other farmers in terms of size, assets and the cost of accessing the market. For instance, our findings indicate cooperative members are smaller and have older and less efficient technology, which means they may have fewer options when it comes to marketing their output and hence less ability to access higher price buyers. These structural features can be expected to result in higher costs for the cooperative, which reduces its ability to pay a higher price for grapes. The lack of a higher price paid by cooperatives does not necessarily mean that they are not exerting a yardstick effect. If

the cooperative presence increases competition for non-varietal wine, prices may be higher than in a situation without cooperatives.

Worldwide, farmers are confronted with rapid structural change, increasing quality requirements, and powerful downstream actors. Understanding the role of cooperatives on farm incomes and market access in this environment is important. As has been argued in this paper, it is essential that the analysis focus on more than just pricing, since if cooperatives fulfil other functions not accounted for in standard treatments of cooperative behaviour, then the true role of cooperatives in the market will not be understood unless the frame of analysis is widened to include these additional elements.

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4 EMPIRICAL STUDY II (PAPER THREE): UNDERSTANDING MEMBER CHARACTERISTICS AND COOPERATIVE PRICE EFFECTS: THE CASE OF THE ARGENTINEAN DAIRY SECTOR

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Published in *Annals of Public and Cooperative Economics*, DOI: 10.1111/apce.12247[12]

Abstract

Since the 1990s, Argentinean dairy-processing cooperatives have lost considerable amounts of members and market share. We analyse their current role by investigating the characteristics of farmers who continue delivering to them and price differentials between cooperatives and Investor-Oriented Firms (IOFs). A probit regression model applied to 917 farmers suggests that cooperative farmers are more disadvantaged than farmers delivering to IOFs in terms of education, farm size and productive technology. Moreover, t-tests applied to data representing 70% of national volume indicate that farmers delivering to cooperatives are between 11% and 29% smaller than those delivering to IOFs, depending on province. A hierarchical multilevel regression model applied to 9,720 transactions among farmers and processors shows that, after controlling for quantity and quality, cooperatives pay lower (3.5%) but more stable prices than IOFs. In a context of rapid structural change, we observe a market in which larger farmers

deliver to IOFs and smaller farmers deliver to cooperatives and conclude that, at the expense of paying lower prices, cooperatives may act as buyers of last resort for otherwise disadvantaged farmers.

Keywords: Agricultural cooperatives; Smallholder farmers; Structural change

4.1 Introduction

Milk has unique features among agricultural products, which have led to the emergence of dairy processing cooperatives (United States Department of Agriculture). Milk's storage is only feasible after being processed. Processing facilities are expensive and show substantial economies of scale. Transportation costs are considerable due to milk's weight and perishability concerns, making local farmers and processors interdependent. Therefore, in order to avoid the risk of opportunistic behaviour from private processors, farmers form or join dairy processing cooperatives (Bijman, 2018; Bonus, 1986).

Dairy processing cooperatives in Argentina have developed in a peculiar path. Worldwide, dairy processing cooperatives have played historically important roles as drivers of new technologies and market developers (Cunningham, 2009; Le Cren et al., 2009). In most milk producing countries, cooperatives continue to operate as important actors in the processing and marketing of dairy products (Depetris de Guiguet and López, 2017; Hanisch et al., 2012). Argentina also had a strong cooperative system (Cappellini, 2011). However, since 1990, with the introduction of structural reforms, dairy processing cooperative membership bases started to decrease sharply, even more so than the dwindling number of dairy farmers. Between 1996 and 2008, the number of dairy farmers decreased by 65%, whereas the number of farmers delivering to cooperatives decreased by 76%. Consequently, between 1996 and 2014, the share of the total number of farmers delivering their produce to cooperatives decreased from 38 to 20% (Ministry of Agroindustry, 2014).

This paper aims to better understand the role of Argentinean cooperatives in the process of rapid structural change and their effects on farmers by exploring why some of them have stayed with their cooperatives, while others have decided to leave. The decrease in cooperative membership bases may indicate either that many members have stopped farming or that cooperative services have not been able to keep up with those of Investor-Oriented Firms (IOFs) – or both. In this paper we seek to answer two seemingly interrelated research questions: (1) what are the

characteristics of farmers who continue supplying dairy cooperatives? and (2) what role do price differences between cooperatives and IOFs' actually play for farmers membership choices? The first question explores if cooperatives, due to their open membership policy, are dealing with a particular group of farmers. The second question explores to what extent price differences between cooperatives and IOFs may drive farmer membership decisions.

Empirical literature on member characteristics and cooperative price effects has produced mixed results. We contribute to the empirical literature with a research perspective that aims at integrating both aspects in one analysis. After analysing two extensive and unique data sets, we find that Argentinean dairy processing cooperatives deal with the more disadvantaged and smaller farmers, paying them lower but more stable prices. These findings challenge and complement theoretical claims regarding member characteristics and cooperative price effects; therefore, they highlight the need for future theoretical research considering both aspects simultaneously.

The rest of the paper is organised as follows. Section 4.2 reviews and discusses theoretical and quantitative empirical literature on developing countries regarding member characteristics and cooperative price effects. Section 4.3 outlines the context of our study: the characteristics of the Argentinean dairy sector. Section 4.4 describes the data and methods used, while section 4.5 presents the results. Finally, section 4.6 discusses the findings and presents the conclusions.

4.2 Literature review

4.2.1 Member characteristics

As member-owned organisations, cooperatives have different characteristics than profit-oriented ones; as a consequence, members are also likely to have different characteristics than non-members (Staatz, 1987b). One perspective within the literature holds that farmers who are better off, in terms of human and physical capital and access to infrastructure, are more likely to be members of cooperatives. However, the empirical evidence for this is inconclusive. Farmers with more human capital may be more likely to join, as they may better understand cooperative benefits. For example, Matchaya and Perotin (2013) corroborate that number of

years of schooling has a positive effect on membership in agricultural cooperatives in Malawi. Yet Francesconi and Heerink (2011) find no such effect in Ethiopian agricultural cooperatives.[13]

Wealth – estimated by farm size and asset endowment – may determine a farmer's capacity to pool resources in a cooperative and, therefore, to join it. Mojo et al. (2015) find that Ethiopian coffee farmers with relatively larger farm sizes are more likely than those with smaller farms to participate in cooperatives, and Fischer and Qaim (2012) provide similar evidence for Kenyan banana farmers possessing relatively greater farm assets. To the contrary, however, Chagwiza et al. (2016) claim that smaller Kenyan grain farmers are more likely to participate than larger ones. Lastly, Schöll et al. (2016) find that farm size has no effect on participation.

Infrastructure availability, including access to roads, information and extension services, may increase the likelihood of farmers participating in a cooperative. For instance, shorter distances to roads can increase their probability of delivering their produce to a cooperative or attending meetings and trainings. Nevertheless, although Verhofstadt and Maertens (2015) find evidence of a positive effect due to infrastructure in Rwandan horticulture and maize cooperatives, Abebaw and Haile (2013) find no evidence of such an effect in Ethiopian agricultural cooperatives.

Meanwhile, another strand within the literature suggests that middle-sized farmers have a higher likelihood of being members of cooperatives. Bernard and Spielman (2009) propose a middle-class effect: very small and very large farmers may not derive sufficient benefits from cooperatives to cover the constant costs of participation (financial contributions, time dedicated to meetings, etc). Consequently, middle-sized farmers may be more likely to participate. To our knowledge, however, no study has yet empirically analysed the middle-class effect.

Lastly, in recent years several authors have proposed that farmers participating in cooperatives are becoming increasingly heterogeneous in size, attitudes and objectives. Explaining his lifecycle framework, Cook (2018) states that, in order to grow, cooperatives are trying to attract new members who may have different preferences than those of original members. Structural changes in the farming sector and expansion of cooperative activities in agribusiness contexts may also intensify differences between members (Bijman 2005 as cited in Höhler and Kühl, 2018). Further, in order to meet the requirements of high-quality market segments, cooperatives

[13] Some of the studies considered in this section are mentioned more than once. For reasons of space, the sector and country studied are only provided the first time the study is referenced.

may foster farm-level differentiation to obtain access to differentiated products (Bogetoft and Ballebye Olesen, 2006).

We have not found any empirical literature specifically analysing degrees of member of heterogeneity, but there are a few studies regarding how member heterogeneity affects cooperative decision-making processes and their results. For Brazilian agricultural cooperatives, Pozzobon and Zylbersztajn (2013) find that member heterogeneity increases their democratic costs. Meanwhile, Banerjee et al. (2001) find that larger members in Indian sugarcane cooperatives use their power to depress sugarcane prices, leading cooperatives to retain gains that profit larger members disproportionately.

Summing up, existing empirical studies exploring cooperative member characteristics do not always corroborate theoretical claims and, unfortunately, generally do not provide much explanation for their results. Apart from the mixed results discussed above, most studies refer to different countries, institutional settings and products, preventing further comparative analysis of their findings.

4.2.2 Cooperative price effects as member incentives

From a neoclassical economics perspective, different firms, such as IOFs and cooperatives, may pay different prices for agricultural products due to ownership structure, imperfect information, or product characteristics. First, ownership structure means that farmer-owned organisations most likely have different objectives than IOFs (Sukhtankar, 2016).[14] Different objectives may lead to different price policies and, according to the structure of the market, to a particular market equilibrium (Sexton and Lavoie, 2001). Second, if farmers have imperfect information, they may accept lower prices from one purchaser, since they do not know the prices paid by all other buyers (Sauer et al., 2012). Third, highly perishable, costly to transport, and spatially distributed products, such as milk and vegetables, may be sold to the closest buyer, even at lower prices (Graubner et al., 2011).

[14] While IOFs are typically assumed to pursue profit maximization, user-owned organisations such as cooperatives may pursue diverse objectives, including maximization of net earnings (similar to IOFs), maximization of per-unit returns to farmers for product sold or minimization of the per-unit price paid by members for goods or services purchased, maximization of overall member returns (from cooperative plus farm-level profits), or maximization of volume transacted (inputs sold or produce purchased) to achieve economies of scale, reduce excess capacity, or increase market share (Levay, 1983).

Concerning the empirical literature, we have only found studies analysing ownership structure, with mixed results. Some of the previously mentioned studies find that cooperatives pay higher prices than their competitors, due to their ownership structures (Shiferaw et al., 2008; Wollni and Zeller, 2007), whereas others find no price differential (Chagwiza et al., 2016; Shumeta and D'Haese, 2016). Some studies find that results depend on the country and institutional background analysed. For instance, Sauer et al. (2012) find dairy cooperatives pay higher prices than IOFs in Armenia and Ukraine but not in Moldova.

From a new institutional economics perspective, prices may be influenced by transaction costs, mainly including the costs of gathering and processing information needed to carry out transactions, reaching decisions, and negotiating and enforcing contracts (Staatz, 1987a). Whether transaction costs increase or decrease cooperative prices remains open, depending on circumstances. On the one hand, if cooperatives deal with multiple small-scale farmers, the total cost of organising multiple transactions may negatively affect their ability to pay the same prices as IOFs. On the other hand, if cooperatives have closer relationships to their members than IOFs to their input providers, mutual trust may decrease their costs for organising transactions. Moreover, cooperative cost structures may be affected by their lack of well-defined property rights and consequent free-rider, horizon and portfolio problems (Chaddad and Iliopoulos, 2013; Nilsson, 2001).

Studies analysing transaction costs have also generated mixed results. For example, Bernard et al. (2008) and Fischer and Qaim (2012) find that cooperatives pay higher prices than their competitors. However, Padrón et al. (2012), analysing Mexican coffee cooperatives, find that price differentials are related to specific products handled by cooperatives. Only processing cooperatives pay higher prices than IOFs, whereas cooperatives dealing with dry coffee paid lower prices than IOFs. To the best of our knowledge, this last study is the only one finding that cooperatives pay lower prices.

Cooperative objectives can also have an effect on price volatility. Even if performing in increasingly volatile international markets, cooperatives may pay more stable prices and provide a safety net against price risks (Shumeta and D'Haese, 2016). Small-scale farmers may try to protect themselves from price volatility, because it increases their vulnerability to poverty (Jena et al. 2012). Additionally, price volatility can have negative effects on farmers' costs for managing risks and possibilities for financing investments (Tothova, 2011).

Regarding price stability, Milford (2014) and Mujawamariya et al. (2013) find that cooperatives pay more stable prices than their competitors do. Analysing Mexico and Rwanda, respectively, since both studies refer to coffee cooperatives participating in the Fairtrade system, it remains unclear whether the results can be attributed to the cooperatives or Fairtrade.

Overall, existing research on cooperative effects on price setting is more frequent than on price volatility. Most studies attribute cooperatives paying higher prices than IOFs to their ownership structures. However, in many cases, the linkage between theories and cases is only vaguely articulated. Unfortunately, as in the analysis of member characteristics, there are not many studies focusing on the same country and sector, which would allow comparing and contrasting of different studies' findings. Consequently, analysis of member characteristics and price effects of cooperatives remain interesting topics for further analysis. Before presenting our study, the following section introduces the sector we have explored.

4.3 The dairy sector in Argentina and the historical role of cooperatives

Argentina's dairy sector has national and international relevance. In 2015, the country generated around 2% of the world's dairy production and it was the third largest exporter of whole-milk powder in the world (Ministry of Treasure and Public Finances, 2016). In 2017, there were 9,955 milk producers, with 173 cows on average, and 87% of them were located in Buenos Aires, Córdoba and Santa Fe – the main dairy producing provinces (National Agri-Food Health and Quality Service, 2017)

The Argentinean dairy processing sector is highly heterogeneous. In 2010, ten large high-technology firms – with a daily processing capacity greater than 250,000 litres – produced multiple products for domestic and export markets. Meanwhile, about 25 to 30 medium- to large-sized firms (between 50,000 and 250,000 litres capacity) focused mainly on the domestic market, and 50 medium-sized firms (between 10,000 and 50,000 litres capacity) worked at the regional level. Lastly, around 700 small firms (less than 10,000 litres capacity) produced cheese with basic technology for local markets (Cappellini, 2011). Regarding market share concentration, in 2009, the top five firms processed 43.5% of the country's milk, with the two main firms being Mastellone Hnos (IOF) and SanCor (cooperative), having 14.9% and 10.9% market shares, respectively (Cappellini, 2011).

In order to understand the development and former role of cooperatives, it is necessary to look closer at the Argentinean dairy cooperative system's history. In 1930, four primary dairy cooperatives opened their own processing plant, creating the first dairy processing cooperative in South America (Olivera, 2008). In 1937, there were 78 dairy cooperatives, pooling milk to process or to sell to processing firms. At that time, farmers claimed that processing firms were paying low prices, cheating on milk quality, i.e., telling farmers their milk was lower grade than it actually was, and delaying payments (Olivera, 2008), so cooperatives were seen as a countervailing power.

In 1938, SanCor, a second-tier processing cooperative, was created to service 16 primary cooperatives. By 1947, SanCor linked 155 cooperatives and represented 34.5% of butter and 23.5% of casein production at the national level (Olivera, 2011). SanCor introduced modern processing technologies in the industry and drove implementation of new agricultural practices among farmers through primary cooperatives. Moreover, it acquired its own truck fleet to transport milk, invested in improving rural roads, and provided credit to its primary cooperatives to acquire new machinery (Olivera, 2013). In 1984, there were 355 cooperatives associated with SanCor, which had a significant share of the consumer market, with its own branded products and exporting part of its production internationally (Lattuada et al., 2011).[15]

In 1990 an economic liberalisation process was set in motion, which included deregulating and opening markets (Gutman et al., 2003), and triggered a structural change in the sector. To gain presence in international export markets, firms had to comply with private quality standards and quality certification programs (Farina et al., 2005). Foreign investment led to efficiency gains in many firms and more competition in the domestic market. Yet, exposure to international dairy markets also introduced price fluctuations and external competition (Gutman and Ríos, 2010). Consequently, some small processing firms disappeared, and the role of cooperatives in an increasingly internationalising market changed. They were no longer leading technological change and innovation but, rather, struggling with the new scenario. These external factors and internal problems associated with efficiency in management and decision-making resulted in a decrease of SanCor's market share, from 18.4% to 14.9%, between the 1996 and 2004 (Ministry of Agroindustry, 2016; SanCor, 2001, 2005). In 2005, SanCor restructured as a first-tier

[15] There is no historical data for the total number of dairy cooperatives or individual records of other cooperatives besides SanCor, which would have allowed us to provide a more complete characterization of the Argentinean cooperative system.

cooperative with the aim of increasing efficiency by organising transactions directly with farmers and; therefore, decrease management costs (Ressel and Silva, 2008).

The liberalisation process forced farmers to increase their scale and comply with higher quality standards or to disappear. These higher quality standards resulted in the introduction of new animal genetic and feeding technologies, among others, with a resulting increase in costs (Lattuada et al., 2011). Because of the need to increase scale to absorb such costs and growing competition for the use of land with more profitable agricultural activities, such as soybeans, between 1988 and 2002, 65% of dairy farmers abandoned the activity, although average herd size doubled (from 66 to 131 cows per farmer). This was accompanied by an increase in heterogeneity among farmers: whereas 20% of them remained working on a small scale (less than 50 cows), the number of large-scale farmers (more than 200 cows) increased by 800% between 1988 and 2002 (National Institute of Statistics and Censuses, 2002).

Like in most other milk producing countries and as our brief history above has shown, Argentina's dairy sector has developed a strong cooperative system; however, there have been some rather drastic changes since the 1990s. Whereas in 1991 cooperatives processed 24% of national volume (Fernández et al., 2004), in 2014 that share was estimated at 16% (Ministry of Agroindustry, 2016; SanCor, 2014). Between 1996 and 2014, the number of farmers delivering their milk to cooperatives decreased from 8,000 to 1,400, indicating that many farmers left the activity, with some leaving their cooperatives, while others retained membership (Ministry of Agroindustry, 2014). Although the cooperative system entail benefits for their members such as the representation – via SanCor – of their interests in negotiations with other actors in the value chain and the public policy arena (Lattuada et al., 2011), there is no information regarding the price effects of cooperatives and the characteristics of the members. The next section describes the two different data sets and methods of analysis we used.

4.4 Data and methods

4.4.1 Member characteristics

To analyse member characteristics, we used two different methods and data sets. First, 917 records of farmers from the Dairy Sector Survey conducted by the National Institute of Agricultural Technology (INTA) were used to estimate a probit model. The survey corresponded to the agricultural years 2001/02, 2002/03, 2003/04, and 2005/2006, and was

performed in Córdoba, Santa Fe and Buenos Aires. This repeated cross-sectional survey represented around 3% of the farmers of each province.

In our probit model, the explanatory variables related to farmers and their farms' characteristics. Besides age and education, we included the relationship between agricultural and non-agricultural income. Regarding farm characteristics, if farmers milk themselves and do not own a tie-stall barn, it may indicate a less professionalised and efficient farm structure (Cominiello, 2016), which may also be indicated by the number of cows. The farm's productivity may be related to the average daily number of litres obtained per cow. Lastly, the milk's quality is indicated by the fat and protein percentage. Table 12 describes the variables used in the probit model.

Table 12: Socio-economic variables and summary statistics of sampled farmers

Variable name	Description	Members (N=400)			Non-members (N=517)		
		Mean	Standard deviation	Min/Max	Mean	Standard deviation	Min/Max
Age	Farmer age in years	49.91	11.89	23/82	51.72	11.63	24/83
Secondary or higher education	= 1 if farmer has 12 or more years of schooling	0.59		0/1	0.71		0/1
Agricultural income larger than non-agricultural	= 1 if farmer agricultural income is larger than non-agricultural income	0.87		0/1	0.78		0/1
Owner milks	= 1 if farmer milks himself	0.16		0/1	0.10		0/1
Cows	Number of adult cows	129.2	84.25	15/1200	175.2	153.1	30/1,600
Tie-stall barn	= 1if farmer has a tie-stall barn	0.52		0/1	0.66		0/1
Daily litres per cow	Average litres per cow per day	20.33	4.90	7.4/35.3	20.20	4.96	4.84/35.06
Average perc. of fat	Milk's average percentage of fat	3.53	0.15	2.89/4.27	3.52	0.22	2.62/4.84
Average perc. of prot	Milk's average percentage of protein	3.19	0.13	2.74/4	3.20	0.14	2.5/4.29

Source: own calculations, based on data from INTA's Dairy Sector Survey (2001/02, 2002/03, 2003/04, and 2005/2006)

Second, to analyse in depth farmers' size, we examined a data set with 46,400 monthly records of milk sales between 6,620 farmers and 132 dairy processing firms at the national level for seven months during the 2013/14 agricultural year, provided by the Ministry of Agroindustry. This data represents 70% of the national volume transacted for that (Ministry of Treasury and Public Finances, 2016). It is important to highlight that only 5.3% of the respective farmers were simultaneously selling to two different processors, rendering side-selling or simultaneous sales as a phenomenon of limited relevance. We calculated Student's T-tests to analyse, from a farm perspective, the size and heterogeneity of farmers according to their decisions to deliver to cooperatives or IOFs and, from a firm perspective, the size of the transactions performed by cooperatives and IOFs compared to other buyers in the same province. Both analyses seek to shed light on the attributes of farmers delivering to cooperatives and IOFs, respectively.

4.4.2 Cooperative price effects

We used 9,720 monthly records of milk sales between farmers and firms to analyse the price effect of cooperatives, taken from the already mentioned Dairy Sector Survey. To analyse milk prices' determinants, we used a multilevel regression model. To analyse price volatility between different buyers (cooperatives and IOFs), we calculated prices' coefficients of variation.

In our multilevel model, the dependent variable was farm gate price. We compared prices according to buyer type (cooperative or IOF), but we did not have enough data to categorise sellers into members or non-members of cooperatives. Since cooperative members did not receive an end-of-season or end-of-year patronage refund (López and Vaudagna, 2017), prices paid by IOFs and cooperatives could be compared as such.[16] Prices were deflated, using the Wholesale Price Index for milk provided by the Argentinean Ministry of Economics.

The explanatory variables related to the product, buyer, and location of each transaction. Regarding the product, we focused on volume and quality (measured by milk' average percentage of solids, which are composed by protein and fat), expecting they would have a positive effect on prices. Firms were categorised as large, medium and small, according to expert criteria; since larger firms could benefit from economies of scale, we expected them to

[16] No farmer was dealing simultaneously with a cooperative and an IOF.

pay higher prices.[17] We introduced firm type (cooperative or IOF) to analyse whether there was a price differential between cooperatives and IOFs. By introducing the location of the transaction, we sought to account for the structural differences among the three provinces included in the analysis, such as cooperative performance levels. In 2008, dairy cooperatives processed 25% of the provincial production in Santa Fe and 32.9% in Córdoba, while they only processed 10.6% in Buenos Aires (Obschatko et al., 2011). In terms of firm type, whereas Mastellone Hnos (largest IOF in the country) concentrates its activities mainly in the province of Buenos Aires, SanCor (largest cooperative) does so in Córdoba and Santa Fe. Some variables were transformed to logarithms to improve their distributional properties. Table 13 describes the variables used in the multilevel model.

Table 13: Economic and productive variables and summary statistics of sampled transactions

Variable name	Description	Members (N=3,269)			Non-members (N=6,451)		
		Mean	Std. Dev.	Min/ Max	Mean	Std. Dev.	Min/Max
Price	Deflated price per milk litre in Pesos	1.23	0.14	1.00/3.23	1.30	0.22	1.00/3.56
Litres sold	Monthly milk volume sold in litres	10.78	0.61	8.17/13.32	10.98	0.080	7.09/13.74
Ln solids	Natural logarithm of the percentage of solids per milk litre	-2.68	0.03	-2.8/-2.49	-2.69	0.05	-2.97/-2.36
Firm medium	= 1 if buyer is a medium firm	0.21		0/1	0.42	0.49	0/1
Firm small	= 1 if buyer is a small firm	0		0/1	0.22		0/1
Prov Cba	= 1 if province is Córdoba	0.40		0/1	0.10		0/1
Prov Sta Fe	= 1 if province is Santa Fe	0.58		0/1	0.45		0/1

Source: own calculations, based on data from INTA's Dairy Sector Survey (2001/02, 2002/03, 2003/04, and 2005/2006)

Our multilevel regression model acknowledges the different levels of aggregation in the data, which can only be partially achieved by introducing dummy variables to account for levels in an ordinary least squares regression (Robson and Pevalin, 2016). In comparison with ordinary least squares regressions, multilevel regressions render more properly estimated standard errors and corrected degrees of freedom (Huang, 2018). Here, the hierarchical multilevel model

[17] An expert from INTA provided the categorisation used here.

allowed us to acknowledge that observations correspond to different months that belong to different years. Grouping observations by month allowed us to consider price differentials due to seasonal factors, such as pasture availability, while grouping observations by year may have reflected macroeconomic changes, such as in domestic and international demand for dairy products (Gutman et al., 2003). The hierarchical or nested model for observation *i* in month *j* and year *k* was formulated as follows:

$$\ln\_price_{ijk} = \beta_1 + \beta_2 \ln\_litres\_sold_{ijk} + \beta_3 \ln\_solids_{ijk} + \beta_4 firm\_medium_{ijk} + \beta_5 firm\_small_{ijk} + \\ + \beta_6 coop\_buyer_{ijk} + \beta_2 prov\_cba_{ijk} + \beta_4 prov\_stafe_{ijk} + \zeta_{1j} + \zeta_{2k} + \zeta_{3jk} + \varepsilon_{ijk}$$

where the betas are coefficients to be estimated, ζ_{1j}, ζ_{2k} and ζ_{3jk} are random intercepts introduced by month, year and the interaction between year and month. They are assumed to be normally distributed with a zero population mean and variances, ψ_j, ψ_k and ψ_{jk}, respectively; and each of them is uncorrelated across levels. The variable ε_{ijk} is the residual at observation level, with a zero population mean, uncorrelated across observations, years and months, and with a constant variance, θ, interpretable as the within-observation variance (Rabe-Hesketh and Skrondal, 2012). Having presented the data sets and proposed our forms of analysis and methods, the next section presents the results of our investigation.

4.5 Results

4.5.1 Analysis of member characteristics

Farmers delivering to cooperatives are more disadvantaged than farmers delivering to IOFs. Farmers with less education and those with larger agricultural income than their non-agricultural income have a higher probability of delivering to a cooperative. In other words, they depend more on agricultural for their livelihood. Moreover, these farmers have a lower number of adult cows and are less likely to use a tie-stall barn, which indicates a lower technological level. Regarding production, there are no differences of productivity or product quality between farmers delivering to cooperatives and IOFs, at a five percent confidence level. Nevertheless, due to the lack of data, other quality parameters such as the level of bacteria could

not be analysed; therefore, the results regarding milk' quality are restricted.[18] Table 14 reports the results.

Table 14: Member characteristics (probit model)

Variables	Coefficients	Standard errors	dF/dx [(a)]
Age	-0.0128***	(0.0039)	-0.0047
Secondary or higher education	-0.2698**	(0.1048)	-0.1020
Agricultural income larger than non-agricultural	0.0095	(0.1387)	0.0352
Owner milks	-0.2788**	(0.1171)	-0.0824
Cows	-0.0019***	(0.0005)	-0.1030
Tie-stall barn	-0.1870**	(0.0934)	-0.0703
Daily litres per cow	0.0018	(0.0087)	-0.0006
Average perc. of fat	0.0812	(0.3662)	0.0302
Average perc. of prot	0.4694*	(0.2548)	0.1740
Constant	-1.1155	(1.151)	
Number of observations	917		
McFadden's R^2	0.055		
Log likelihood	-593.703		
Likelihood ratio χ^2	68.857***		

* Significant at= 0.10, ** significant at=0.05, *** significant at= 0.01

Note: (a) Marginal change in probabilities evaluated at the sample means

Source: own calculations, based on data from INTA's Dairy Sector Survey (2001/02, 2002/03, 2003/04, and 2005/2006)

The goodness of fit of our model, estimated by the McFadden's pseudo R^2, indicates that the model lacks high predictive ability. McFadden's R^2 values between 0.2 and 0.4 are considered as indicators of extremely good fit (Elder et al., 2012). This suggests that a model including variables for which we had no information such as farmers' risk attitude and trust would probably render a better fit. Nevertheless, comparing this model to its alternatives by stepwise excluding each variable at a time, the highest drop in the goodness of fit happens when we drop the variable adult cows (from 0.055 to 0.040), indicating the relevant contribution of the variable to the model's goodness of fit.

Using the extensive data set from the Ministry of Agroindustry, we further explored and, again, find that farmers delivering to cooperatives are smaller than those delivering to IOFs. We

[18] Although statistically significant, valuated at the sample mean of all variables, the probability of delivering to a cooperative has a very small marginal change for a year increase in farmers' age (0.047). Therefore, it was not interpreted as relevant.

calculated farmers' average litres delivered per day. At the national level, the percentage of small farmers (less than 1,000 litres per day) delivering to cooperatives is almost identical to those delivering to IOFs. Regarding medium (1,000 to 2,000) and medium to large size farmers (2,001 to 4,000), the percentage of farmers delivering to cooperatives is larger than those delivering to IOFs. Therefore, the percentage of large farmers (more than 4,000) is smaller for cooperatives than for IOFs, indicating they prefer to sell to other organisations than cooperatives. Figure 8 shows these ratios in detail.

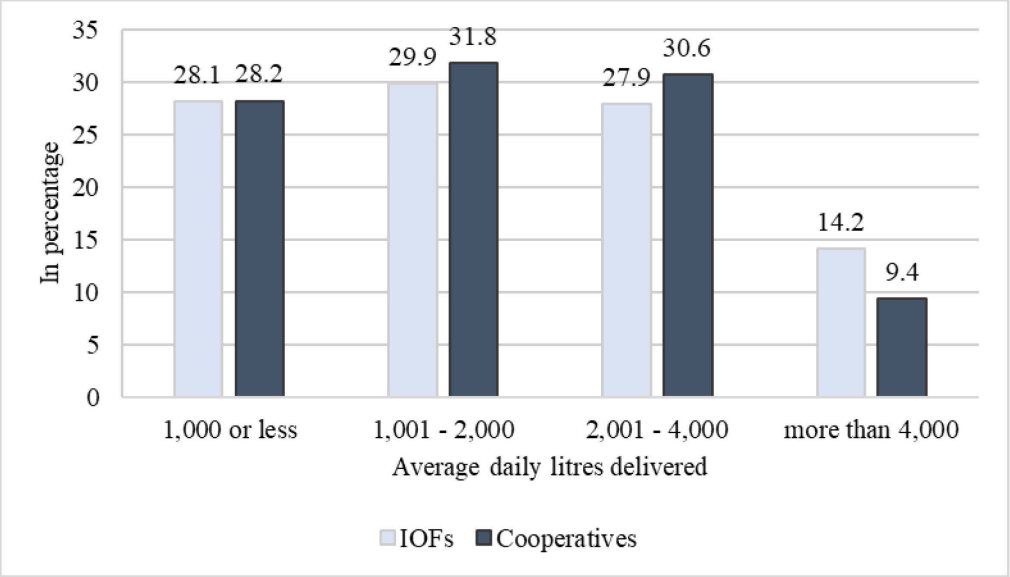

Figure 8: Average daily milk litres delivered per farmer according to buyer

Source: own calculations, based on data from Argentinean Ministry of Agroindustry (2014)

At provincial level, we confirmed that farmers dealing with cooperatives are smaller and less heterogeneous in size than farmers dealing with IOFs. Two sample t-tests comparing the average daily deliveries showed that, in three provinces analysed, the average daily number of litres transacted with cooperatives is smaller than it was with IOFs, at the 0.01 significance level. Where cooperatives have higher market shares, these differences are smaller (between 15.6 and 21% in Córdoba and 11.1 and 16.3% in Santa Fe) than in Buenos Aires (between 18.2 and 28.8%), where they do not.

To analyse heterogeneity, we calculated the range and standard deviation of farmers' average daily litres of milk delivered (Höhler and Kühl, 2018). In each province, the range, which is the difference in the average daily deliveries between the smallest and the largest farmer, is less pronounced in cooperatives than in IOFs. The Levene test for equal variances showed that cooperative farmers have a smaller standard deviation than farmers delivering to IOFs, at the

0.01 significance level. Both observations, lower range and lower standard deviation, indicated that a particular group of farmers is delivering to cooperatives. This group of farmers is more homogeneous in size than farmers delivering to IOFs. Table 15 presents means and standard deviations' comparisons in detail.

Table 15: Mean and standard deviation comparisons in average daily milk litres delivered per farmer according to buyer and province

Province	Members (N=9,638)					Non-members (N=36,762)				
	N	Mean	Std. Dev.	Min/Max	Range	N	Mean	Std. Dev.	Min/Max	Range
Buenos Aires	895	3,019	2,907	33/19,614	19,581	8,080	3,946	4,021	20/32,197	32,177
Córdoba	4,761	2,340	1,992	23/29,684	29,661	11,119	2,864	2,674	22/35,058	35,036
Santa Fe	3,982	1,792	1,416	21/23,428	23,407	17,563	2,078	3,030	20/45,465	45,445

*** Significant at = 0.01

Notes: (a) H0: mean (Cooperatives) = mean (IOFs) and H1: mean (Cooperatives) ≠ mean (IOFs)

(b) H0: standard deviation (Cooperatives) / standard deviation (IOF) = 1 and H1: standard deviation (Cooperatives) / standard deviation (IOF) ≠ 1

Source: own calculations, based on data from Argentinean Ministry of Agroindustry (2013/2014)

Table 16: Mean and standard deviation comparisons in average daily milk litres delivered per farmer according to buyer and province (continued)

Province	Mean difference t-test [(a)]	[95% Confidence Interval for difference]		Standard deviation difference f-test [(b)]
Buenos Aires	8.6713***	718	1,138	1.9128***
Córdoba	13.6211***	448	598	1.8032***
Santa Fe	10.2799***	231	340	2.3491***

Notes: (a) H0: mean (Cooperatives) = mean (IOFs) and H1: mean (Cooperatives) ≠ mean (IOFs)

(b) H0: standard deviation (Cooperatives) / standard deviation (IOF) = 1 and H1: standard deviation (Cooperatives) / standard deviation (IOF) ≠ 1

Source: own calculations, based on data from Argentinean Ministry of Agroindustry (2013/2014)

At the firm level, the average cooperative transaction volume is smaller than the IOF's. The 138 processing firms that registered transactions during 2013/14 were categorised in four intervals, according to their daily processing capacity. For each province and interval, we compared the average size of transactions performed by cooperatives and IOFs.[19] In 6 out of the 7

[19] As there were not cooperative transactions within each daily processing capacity interval and province, comparisons were only performed when possible.

comparisons, t-tests showed that the average cooperative transaction size is smaller than the average transaction size between a farmer and an IOF, at the 0.01 significance level. Table 16 presents the complete data regarding these differences.

Table 17: Mean comparisons in average daily litres of milk processed according to buyer, processing capacity and province

Province	Daily processing capacity (in litres) [(a)]	Members (N=9,638)		Non-members (N=36,762)		Mean difference t-test [(b)]
		N	Mean	N	Mean	
Buenos Aires	Large	704	3,431	6,160	4,583	8.9618 (0.0000)***
	Medium to large			537	2,540	
	Medium	192	1,507	944	1,769	2.5639 (0.0000)***
	Small			439	1,406	
Córdoba	Large	4,215	2,373	7,112	3,168	16.6507 (0.0000)***
	Medium to large	413	2,454	2,447	2,425	
	Medium			1,215	2,372	
	Small	133	942	345	1,143	6.1415 (0.000)***
Santa Fe	Large	3,933	1,810	14,017	2,153	11.8991 (0.000)***
	Medium to large			2,047	2,023	
	Medium			892	1,823	
	Small	48	236	607	1,084	14.8835 (0.0000)***

*** Significant at = 0.01

Notes: (a) Large = daily processing capacity larger than 250,000 litres. Medium to large = 50,001 to 250,000 Medium = 10,001 to 50,000. Small = less than 10,000

(b) H0: mean (Cooperatives) = mean (IOF), and H1: mean (Cooperatives) ≠ mean (IOF)

Source: own calculations, based on data from Argentinean Ministry of Agroindustry (2013/2014)

4.5.2 Analysis of cooperative price effects

Farmers delivering to cooperatives receive lower prices than farmers delivering to IOFs. Our hierarchical multilevel regression model analysed the determinants of milk prices at the farmgate level by introducing the variable Cooperative buyer (dummy equal to one when the buyer is a cooperative) to analyse whether there was a price differential between cooperatives and other firms, while controlling for quality, quantity, location and size of buyer. We find that farmers delivering to a cooperative have a negative effect on the price they receive, as cooperatives pay, on average, 3.5% less than IOFs. Moreover, our results show the expected outcomes in terms of quantity and quality. A one percent increase in litres sold by either group of farmers would increase the price paid for milk by 0.01% and increasing the quantity of solids by one percent would increase the price paid by 0.31%. In other words, product quality and

quantity have a positive effect on prices paid, regardless of the buyer's type. A medium-sized dairy processor would pay 1.26% less than a large firm, and a small firm would also pay less than a large firm (though this coefficient was not significant). Lastly, we find that, regardless to whom they deliver, farmers located in Córdoba and Santa Fe receive 4.6% and 4.9% less than farmers in Buenos Aires. Table 17 reports the results.[20]

Table 18: Price determinants (multilevel model)

Variables	Coefficients	Standard errors
Litres sold	0.0107***	(0.0018)
Ln solids	0.3090***	(0.0274)
Firm medium	-0.0126***	(0.0038)
Firm small	-0.0038	(0.0024)
Cooperative buyer	-0.0359***	(0.0039)
Prov Cba	-0.0474***	(0.0052)
Prov Sta Fe	-0.0521***	(0.0040)
Constant	-0.9971***	(0.0816)
Random intercept year (ζ_{1j})	0.0361***	(0.0122)
Random intercept month (ζ_{2k})	0.0306***	(0.0094)
Interaction between year & month (ζ_{3jk})	0.0345***	(0.0050)
ε_{ijk}	0.1185***	(0.0009)
Number of observations	9,720	

* Significant at= 0.10, ** significant at=0.05, *** significant at= 0.01

Source: own calculations, based on data from INTA's Dairy Sector Survey (2001/02, 2002/03, 2003/04, and 2005/2006)

The multilevel model regression introduced random intercepts for each month and year.[21] Following Rabe-Hesketh and Skrondal (2012), we calculated the coefficient of determination (R^2) between the null multilevel model (including no covariates) and the full multilevel model (including all covariates). The coefficient indicated that 9% of the variance found is explained by the covariates in the ML model.[22] Appendix 2 presents the residuals of the model.

[20] For reasons of space, the estimation results of an OLS model that corroborated the findings were omitted but are available upon request.

[21] Running a multilevel model without covariates and year as the only level variable explains 10.6% of the variance in the dependent variable (natural logarithm of the real price of milk), while month as the unique level variable explains 7.8%. Therefore, both variables appear to be suitable as levels.

[22] The subscript 0 indicates the null ML model (without covariates) and the subscript 1 indicates the full model (with covariates).

$$R^2 = \frac{\left[\left(\hat{\psi}_{j0} + \hat{\psi}_{k0} + \hat{\psi}_{jk0} + \hat{\theta}_0\right) - \left(\hat{\psi}_{j1} + \hat{\psi}_{k1} + \hat{\psi}_{jk1} + \hat{\theta}_1\right)\right]}{\left(\hat{\psi}_{j0} + \hat{\psi}_{k0} + \hat{\psi}_{jk0} + \hat{\theta}_0\right)}$$

$$R^2 = \frac{\left[\left(0.0136^2 + 0.009^2 + 0.0047^2 + 0.0009^2\right) - \left(0.0122^2 + 0.0094^2 + 0.005^2 + 0.0009^2\right)\right]}{\left(0.0136^2 + 0.0009^2 + 0.0047^2 + 0.0009^2\right)} = 0.09$$

Farmers delivering to cooperatives experience less price volatility than farmers delivering to IOFs. We measured the realised price volatility with the Coefficient of Variation (CV), which is the ratio of the standard deviation over the mean price per agricultural year (O'Connor and Keane, 2011). We find that cooperative milk prices are less fluctuant than prices paid by IOFs in three out of the four periods considered and in both Córdoba and Santa Fe. Table 18 details these results.

Table 19: Price coefficient of variation according to buyer, period and province

Province	Period	Cooperatives				IOFs			
		N	Mean	Std. Dev.	CV	N	Mean	Std. Dev.	CV
Córdoba	2001/02	876	1.10	0.14	12.56	1,272	1.22	0.36	29.91
	2002/03	204	1.16	0.34	29.30	108	1.20	0.28	23.81
	2003/04	600	1.31	0.10	7.66	1,008	1.32	0.13	9.85
	2005/06	63	1.21	0.07	6.36	112	1.39	0.19	13.53
Santa Fe	2001/02	732	1.11	0.14	13.02	1,656	1.10	0.20	18.08
	2002/03	888	1.16	0.25	21.68	1,560	1.18	0.29	24.78
	2003/04	912	1.27	0.08	6.55	696	1.30	0.12	9.68
	2005/06	98	1.23	0.08	6.42	154	1.20	0.10	8.86

Source: own calculations, based on Dairy Sector Survey (INTA) (2001/02, 2002/03, 2003/04, and 2005/2006)

4.6 Discussion and conclusions

In a context of structural change where some farmers had left their cooperatives, while others had chosen to stay, and aiming to understand the role of Argentinean dairy cooperatives and their effects on farmers, our paper set out to analyse two related questions: (1) what are the characteristics of farmers who continue supplying dairy cooperatives? and (2) what role do price differences between cooperatives and IOFs actually play for farmers' membership choices? We find that farmer characteristics and differentiated pricing motivate their delivery decisions and that dairy processing cooperatives in Argentina generally deal with the more disadvantaged and smaller farmers. Analysing price determinants, we find that – ceteris paribus – cooperatives pay lower but more stable prices to farmer members than IOFs do.

Our results both challenge and confirm theoretical claims in several ways. First, whereas theory suggests that better-off farmers are more likely to be cooperative members, we find that Argentinean farmers delivering to cooperatives are more disadvantaged compared to those delivering to IOFs in terms of education, number of adult cows and technological facilities. Moreover, they depend more on agricultural income than farmers delivering to IOFs.

Second, another theoretical claim suggests that middle-sized farmers may be more likely to participate in cooperatives, since smaller and larger farmers do not elicit enough benefits from membership to cover their participation costs. We, however, observe a quite similar share of small farmers in cooperatives and IOFs and a larger share of middle-sized farmers, therefore the share of larger farmers is actually much lower in cooperatives.

Third, in spite of the vast literature suggesting that the heterogeneity of cooperative members is increasing, our case reveals a more and more consolidated and mature cooperative sector pattern in terms of size classes, in which cooperative members are rather more homogeneous as a group than farmers delivering to IOFs.

Fourth, combining our results from the analysis of member characteristics and prices, we suggest that cooperatives' lower but more stable prices may be related to cooperative farmers being smaller than those in IOFs. We believe this pattern to be the result of a "screening for the best producers" process (Crespi et al., 2012). Large dairies need to fill their capacity and compete among each other for "the best" (larger) milk producers. Large producers allow processors to realise economies of scale. The result of this competition is a price premium for larger processors. Cooperatives seem to be dealing more and more with another type of farmers, the small farmers to whom they cannot pay a competitive price, probably due to higher costs. Therefore, we suggest that effects on the cost structure of cooperatives may result from the particularities of cooperative members and not from the mentioned cooperative property rights problems.

Finally, our results can contribute to the yet scarce empirical literature on developing countries, showing that cooperatives pay more stable prices than their competitors. However, the lower price volatility of cooperatives may simply reflect a non-random sorting of risk-averse farmers into them (Staatz, 1987b) and not actually indicate a cooperative feature. Nevertheless, even if this is the case, it certainly supports our argument that a separation of the market between more disadvantaged and less disadvantaged farmers has taken place, generating the observed pattern.

Our research has some limitations and two key factors that may have affected the results. First, regarding information sources, although the transactions registered by the Argentinean Ministry of Agroindustry represent a very considerable share of the market (70%), it is likely that smaller farmers and firms have a lower propensity to register their transactions, because they probably operate with higher degrees of informality. If those farmers were to be considered, the size

differential between farmers delivering to cooperatives and IOFs could decrease. Second, the data we used to analyse prices corresponds to a period of severe social and economic crisis (from 2000/01 through 2003/04) and subsequent recovery (2005/06). It could be that, in those years, the unrestricted delivery right provided by cooperatives were of higher value for farmers than the lower prices being paid, enabling them to remain producing, despite contraction of dairy demand. This points to a need to increase the time span of the analysis. Unfortunately, our analysis could not be extended, due to the price stabilisation program implemented in 2007 (Petrecolla, 2016). Lastly, most of the analysis focuses on the role of SanCor, the largest cooperative. However, in 2008, there were 26 medium to small processing cooperatives (Obschatko et al., 2011), for which there is scarcely any data or literature available.

We suggest that, for the smaller and more disadvantaged farmers delivering to cooperatives, the value of the right to deliver entailed by membership – in concert with gaining a better bargaining position and access to public policy instruments, as revealed in section 4.3 – and lower levels of price fluctuation seem to outweigh their price disadvantages. Therefore, we conclude that cooperative membership may represent a way of ensuring small farmers against the hardships of structural change (Nilsson et al. 2016).

To arrive at this conclusion, we developed an approach that takes into account the increasing heterogeneity among dairy farmers in Argentina, caused by the structural change process begun in the 1990s. In the course of this process, we claim that the role of cooperatives has changed over time. In order to better understand why some farmers continue to deliver to cooperatives that do not pay competitive prices, we integrated the observed growing segmentation among dairy farmers into our explanation of the role of cooperatives in dairy production.

Future research should be directed at establishing causality between price differentials and cooperative transaction costs resulting from dealing with great numbers of small-scale farmers. The effects of particular features of farmers dealing with cooperatives on cooperative performance should be addressed. It could be important to establish whether smaller farmers choose cooperatives because of their particular benefits or because IOFs only benefit larger farmers, leaving smaller farmers without any choice but to deliver to cooperatives.

Future theoretical developments could consider cooperative pricing and farmer attributes simultaneously, in order to contribute to a meaningful theory of cooperative change. The literature on the effects of cooperatives on farmer welfare has generated rather mixed results. A

context in which cooperatives pay lower prices than their competitors is generally seen, to a degree, as signalling cooperative failure. Our findings suggest that one of the reasons for the mixed record cooperatives have had in the literature is based upon problems in their conceptualisation and, consequently, we propose that many contexts in which cooperatives coexist with IOFs deserve a closer look at the roles that cooperatives and IOFs play. Situations that have been modelled as competitive may actually be ones in which, after a period of screening and segmentation, cooperatives and IOFs serve quite different actors in the market. At the same time, it needs to be considered that the role of cooperatives for market development may change over time and that these changes may have to do with the limited ability of cooperatives to discriminate against marginal producers. Because cooperatives have to serve all members, they may not be able to only retain the most productive farmer as members. Cooperatives may then choose to integrate small farmers into markets at the expense of lower efficiency and performance, due to their higher transaction costs. Though paying lower average prices, they may still convey benefits such as guaranteed delivery rights, lower price volatility and greater market access, thus helping farmers to survive in difficult conditions.

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5 EMPIRICAL STUDY III (PAPER FOUR): MECHANISMS OF INCLUSION: EVIDENCE FROM ZAMBIA'S FARMER ORGANISATIONS

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Published in *European Journal of Development Research*, DOI: 10.1057/s41287-019-00212-8[23]

Abstract

Policymakers and donors increasingly rely on farmer organisations (FOs)* when implementing rural development strategies, though research suggests that targeted groups such as poorer households tend to participate less in FOs than richer ones. Here we discuss mechanisms that may contribute towards inclusion of disadvantaged households, using primary data from Zambian FOs involved in implementing an agricultural subsidy programme and applying qualitative comparative analysis to identify individual and combined effects of four explanatory factors on inclusion. Our results suggest long-term commitment as a necessary condition. We further identify three alternative pathways that explain inclusion while within-case analysis describes their underlying causal mechanism: inclusion develops in FOs that show commitment and either provide financial services to vulnerable members, promote social identities or compensate disadvantaged members for not being able to access subsidised inputs. These results can explain why some FOs are more effective than others in reaching disadvantaged target groups.

Keywords: Agricultural cooperatives; Producer organisations; Smallholder farmers; Input subsidy programme; Qualitative Comparative Analysis (QCA)

* This article uses the term farmer organisations to maintain coherence with the local name. Nevertheless, these organisations orient themselves according to cooperative principles.

[23] The final publication is available at Springer Nature

5.1 Introduction

In recent years, policymakers and donors have shown renewed interest in farmer organisations (FOs) to foster rural development (Berkhout et al., 2018; Gouet et al., 2009), expecting them to provide services that may reduce transaction costs and other market failures for smallholder households, thereby raising production levels and rural incomes (Grashuis and Su, 2019; Thorp et al., 2005). They are also considered a cost-effective tool for implementing poverty-reduction programmes and channelling external benefits to rural target groups (Chirwa et al., 2005; Markelova and Mwangi, 2010; Shiferaw et al., 2011). In this regard, it is often assumed that their voluntary and democratic character make FOs participatory for poorer households.

The FO literature, however, suggests that their terms of membership may marginalise participation of poorer households (Bernard and Spielman, 2009; Chirwa et al., 2005; Thorp et al., 2005), which has also been observed in empirical studies describing participation through membership determinants (E. Fischer and Qaim, 2012; Francesconi and Heerink, 2011; Verhofstadt and Maertens, 2015).

While these studies provide important insights regarding the participation patterns of different groups of farmers, we note that FOs are autonomous and member-owned businesses, responding to member needs. Thus, the ability and motivation of FOs to promote participation of poorer households may be limited. While this is particularly true for FOs in which the majority of members prioritise efficiency over equity objectives (Lutz and Tadesse, 2017; World Bank, 2008), the opposite may be true for those FOs involved in implementation of poverty-reduction programmes. Here, the effectiveness of such programmes may partly depend on the ability of FOs to reach intended target groups, making inclusion or the participatory scope quite relevant. Such FOs may be required to extend their membership to households who are entitled to programme benefits but who may lack resources and abilities to participate as members in FOs. To describe this process, *inclusion* is defined as 'removal of institutional barriers and enhancement of incentives to increase the access of diverse individuals and groups to development opportunities' (World Bank, 2013: 256).

The literature on FOs proposes a number of organisational factors that may shape inclusion in FOs (see section 5.2.3) but common among them is that they have been proposed on an individual basis when, in reality, inclusion is a multidimensional concept and may depend on a combination of factors (World Bank, 2013). Using comparative case analysis, our aim is to

identify individual factors or combinations of factors explaining inclusion in order to investigate the following question: What are the mechanisms contributing towards inclusion of disadvantaged households?

We frame our analysis in the context of Zambia's Farmer Input Support Programme (FISP) that identifies and reaches its beneficiaries through local FOs. Yet, previous studies suggest that this programme is not fully reaching target groups, as inputs are being diverted to relatively better-off farmers (Jayne et al., 2018; Mason et al., 2013; Mason and Tembo, 2015; Rickert-Gilbert et al., 2013), making this subsidy programme an interesting case for analysing inclusion within FOs.

Beyond complementing the literature on the role of FOs in Zambia's FISP implementation, this paper seeks to contribute to the discussion concerning whether and under what conditions FOs may serve as an appropriate tool for channelling benefits from development programmes to disadvantaged households. More broadly, we see this paper contributing to the discussion on the potentials, limits and conditions for FOs to act as drivers for inclusion.

The section 5.2 presents conceptual considerations before discussing the state of inclusion in Zambia's subsidy programme and introducing the explanatory factors identified from literature. Meanwhile, section 5.3 introduces our qualitative comparative analysis method, case selection and operationalisation while section 5.4 and 5.5 present results from cross-case and within-case analysis, respectively. We discuss our results in section 5.6 and offer conclusions.

5.2 Concept of inclusion and empirical background

5.2.1 Conceptual considerations

The concept of inclusion seeks to describe a complex social phenomenon that remains relatively abstract and difficult to grasp (de Haan, 2011; Pouw and Gupta, 2017). The concept has two meanings, either understanding inclusion as a static and desirable outcome or as a process that takes place between different actors in society (A. Fischer, 2011). Empirical researchers have tended to prefer the first meaning, as it can be measured against predefined indicators via standardised quantitative methods. Most commonly, such studies analyse to what extent different types of groups are present in a respective programme (Khan et al., 2015). A major problem with such application of the concept is that results generated typically do not provide meaningful insight regarding underlying mechanisms contributing to observed outcomes.

Furthermore, researchers are challenged to identify individuals at risk of exclusion from development opportunities as, due to high levels of deprivation in many developing societies, it is not always clear who is more disadvantaged, relative to others (Sen, 2000; World Bank, 2013). In many cases, it is not enough to compare individuals against their relative incomes; rather, a more contextualised and relational approach needs to be taken, because whether or not individuals are included or excluded often depends on their position in society (Gupta et al., 2015). Inclusion may be able to correct for unequal power relations, but it may also require proactive behaviour towards individuals who lack resources to fully participate on their own (Khan et al., 2015).

5.2.2 Contextualising inclusion in Zambia's Agricultural Subsidy Programme

5.2.2.1 Empirical background and programme targets

Zambia is located in southern Africa and is well endowed with natural resources and relatively favourable climatic conditions. Agriculture is the main source of income for the majority of the rural population while subsistence farmers, cultivating on average 2.1 hectares of land and dedicating almost all resources towards maize production, dominate the agricultural sector (Indaba Agricultural Policy Research Institute, 2016). But there is a visible gender divide, with female-headed households cultivating smaller fields (80 versus 61% of female- versus male-headed households cultivate less than 2 hectares), having lower maize yields (1.9 versus 2.2 kg per hectare), earning less (9,000 versus 20,000 Zambian Kwacha gross annual income) and being more likely to be poor (85 versus 76%) than their male counterparts (ibid). Overall, Zambian agricultural production lags far behind its potential, with food and nutritional-security issues remaining alarmingly high.

Some argue that the country's overdependence on mineral resources has impeded agricultural development (Üllenberg et al., 2017). As of 2016, Zambia held the second and ninth largest copper reserves in Africa and the world, respectively (Statista, 2018). Thus, copper production has historically evolved as the country's economic backbone, which induced an early urbanisation process, making it today one of the most urbanised countries in sub-Saharan Africa. Historically, this has put additional pressure on the agricultural sector to supply the growing urban population with enough food at affordable prices, leaving the country with a long history of large-scale subsidy programmes to promote agricultural production and food

security. Because maize is both the main staple and commercial crop, it has been highly politicised (Mason et al., 2013).

The current FISP applies a set of eligibility criteria to decide who has the right to benefit from the programme, targeting vulnerable but viable farmers who cultivate 0.5 to 5 hectares, can prove membership in an FO, have not defaulted on the previous credit programme and are not beneficiaries of the Food Security Programme (Ministry of Agriculture and Livestock, 2014a). In practice, FISP is a rationed programme, meaning that subsidies are insufficient to serve all eligible farmers. Around 30% of all smallholder households receive FISP support, of which 79% fulfil the eligibility criteria (Mason et al., 2013). Although 'FISP performed fairly well in allocating subsidised fertiliser to eligible households' (ibid: 617), it turns out that subsidies generally do not reach the poorest households but are, rather, diverted to households that cultivate relatively larger fields (above 2 hectares) and are less likely to fall below the poverty line (ibid). With subsidies going towards relatively better-off farmers, the effect of FISP on production levels, maize prices and poverty-reduction has been marginal (Jayne et al., 2018; Mason and Smale, 2013; Mason and Tembo, 2015; Rickert-Gilbert et al., 2013).

5.2.2.2 Programme implementation and farmer organisations

Since the early 2000s, there has been a new wave of African subsidy programmes with highly diverse forms of implementation (Jayne et al., 2018). Whereas targeted subsidy programmes in Malawi, Tanzania and Kenya use voucher schemes, Zambia's FISP has mostly delegated implementation to local FOs, which provide the institutional link between the programme and individual farmers, possibly influencing patterns of inclusion and exclusion (Kabeer, 2000).

To participate in FISP, FOs need to be fully registered, active for at least one year in crop production, and have written bylaws and a standing executive committee (Ministry of Agriculture and Livestock, 2014a). They preselect potential FISP beneficiaries from amongst their members and have them approved by the local agricultural committee. Following a positive committee decision, FOs then collect and manage upfront payments for FISP inputs. The programme operates on a cost-sharing basis, meaning that it reduces the retail cost of fertiliser by, for example, up to 79% in 2011/12 (Mason et al., 2013), with beneficiaries required to make upfront payments to cover the remaining costs. After clearing liabilities, FOs collect inputs from the district centre and deliver them to their members. Although members can choose amongst different types of crops, subsidies generally go towards maize, the input packs for

which include 200 kg of fertiliser and 10 kg of hybrid seeds, enabling cultivation of 0.5 hectares of land.

There is at present not much literature on the state of participation in Zambian FOs. In the 2013/14 agricultural season, 44% of smallholders were FO members (Indaba Agricultural Policy Research Institute, 2016), although it remains unclear whether those who actually want to join may face barriers or adverse incentives.

Several lines of evidence suggest that financial barriers may restrict participation. On paper, members pay entry fees, annual membership fees and are obliged to buy shares of the organisation. In the 2013/14 agricultural season, 21% of smallholders indicated non-affordability of FO membership as the second most frequent reason for not benefitting from FISP (Indaba Agricultural Policy Research Institute, 2016). Burke et al. (2012) further estimate that membership costs, together with FISP upfront payments, make up 20% of the gross annual income for 60% of rural households.

5.2.3 A framework for studying inclusion in farmer organisations

5.2.3.1 Inclusion in Farmer Organisations

There is growing consensus that FOs often cannot successfully reach the most disadvantaged households in their regions (Bernard and Spielman, 2009; Chirwa et al., 2005; Thorp et al., 2005). Empirical studies have shown that better-off farmers are more likely to participate in FOs, as likelihood of becoming a member increases e.g., with farm size, education and credit access (Bernard and Spielman, 2009; E. Fischer and Qaim, 2012; Francesconi and Heerink, 2011; Verhofstadt and Maertens, 2015). Evidence also indicates a gender gap, wherein female-headed households are less likely to participate in FOs (Mojo et al., 2017; Wossen et al., 2017).

This raises the question of whether external development programmes can induce inclusion of poorer farming households. To date, however, very few studies have investigated this relationship. Verhofstadt and Maertens (2014) found that Rwandan organisations with subsidised inputs generate higher income effects than those without. Although this increase expected benefits and, thus, incentives to participate, it also attracts a heterogeneous group of farmers to the group. In Senegalese community organisations, Arcand and Wagner (2016) found that membership has become more inclusive, in line with programme regulations. However, they also noticed dropout rates being higher amongst long-established members and women

dropping out even more disproportionally. These results confirm previous findings concerning community organisations in Kenya, where Gugerty and Kremer (2008) concluded that participation in public programmes rather attracts younger, better-educated and wealthier individuals into groups, who then assume leadership positions.

5.2.3.2 Explanatory Factors

The above-mentioned empirical results on inclusion highlight the need to better understand the underlying mechanisms shaping organisational barriers and incentives associated with FOs. Based on the evidence examined, we expect that financial and other barriers may discourage participation of resource-poor and especially female-headed households. Indeed, participation costs are differently perceived across households and tend to marginalise poorer farmers, especially when high-value markets are involved (Chirwa et al., 2005; Markelova and Mwangi, 2010). Women tend to face even higher costs, as their household responsibilities and reproductive activities increase their opportunity costs (E. Fischer and Qaim, 2012). In Uganda, Meier zu Selhausen (2016) found that 88% of female non-members would like to become members of coffee cooperatives but lack sufficient resources or decision-making power to do so.

Regarding possible incentives, the empirical evidence suggests that smaller and larger farmers benefit differently from their membership. While the benefit is relatively larger for smaller farmers (Fischer and Qaim, 2012), larger farmers benefit more in absolute terms, as they produce more and profit from economies of scale when dealing with FOs (Mojo et al., 2015). There is the perception that wealthier farmers are more interested in FOs that value business over equity objectives (Lutz and Tadesse, 2017; World Bank, 2008), but the effect of wealthier farmers on inclusion remains obscure. Some argue that the presence of wealthier farmers may improve leadership and performance while also reducing group coordination costs (Bernard and Spielman, 2009; Dasgupta and Beard, 2007), whereas others warn that rural elites may exert power over others to promote their own interests (Markelova and Mwangi, 2010). Irrespective of the presence of wealthier farmers, we expect that farmers are more likely to invest in organisations that offer tangible benefits. Therefore, long-term commitment may be a prerequisite for inducing inclusion in FOs.

Against this background, we propose the following framework to study inclusion in FOs. Figure 9 shows how organisations can proactively shape inclusion in four ways, related to participation

costs, access to benefits, long-term organisational commitment and participation of wealthier farmers. Although each of these four factors appears to have a direct effect on inclusion, it remains to be seen whether they induce inclusion by themselves or only in combination with each other.

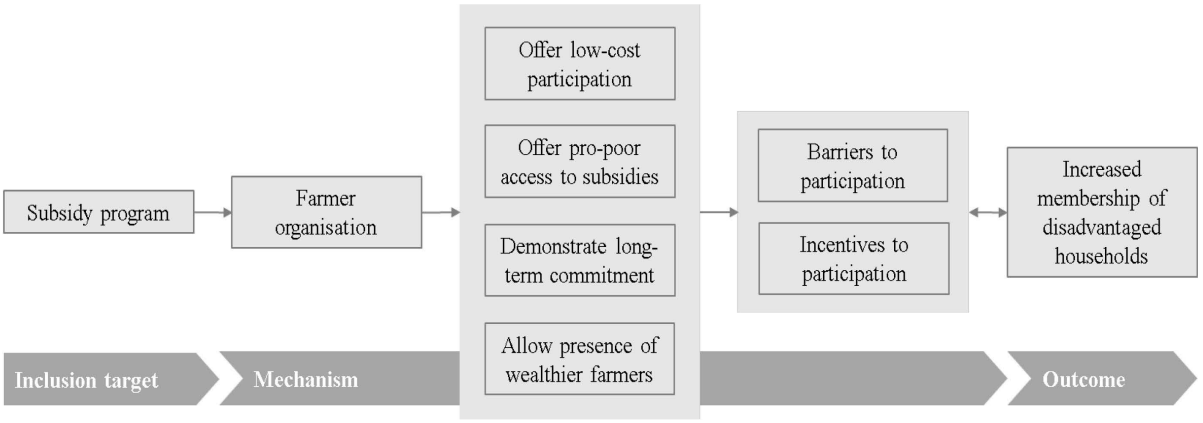

Figure 9: Framework for studying inclusion in Zambian farmer organisations
Source: own graphic

5.3 Data and method

5.3.1 Qualitative Comparative Analysis

We used fuzzy-set Qualitative Comparative Analysis (fsQCA) as our primary method, because it provides an iterative approach to data collection, model specification, case selection and re-conceptualisation of inclusion factors and their outcomes (Ragin, 2000; Schneider and Wagemann, 2012).

Unlike standardised quantitative methods, fsQCA does not rely on a correlational but set-theoretical understanding of causation (Vis, 2012). To exemplify, correlation in quantitative studies implies symmetry in the sense that the presence of a variable can lead to a positive outcome while its absence should lead to a negative outcome. In contrast, fsQCA is based on set-theory and can have different conditions and their combinations explain the outcome and the absence of the outcome. In addition, quantitative methods typically analyse the individual effects of one variable on another while holding all others constant, while fsQCA identifies all necessary and/or sufficient conditions and their combinations that can lead to an outcome. In other words, the results can tell us whether a single explanatory condition (e.g., low-cost participation or benefit access), a combination of conditions (conjunctural causation), or even

multiple paths (equifinal causation) can explain inclusion. By identifying all possible configurations among the explanatory conditions associated with FOs, we expect to reveal their underlying inclusion mechanisms.

The fsQCA method uses set theory to assign different cases to different sets, meaning theoretical constructs that represent conditions and outcomes under study. In our analysis, FOs were treated as individual cases. The method was originally developed to study crisp-set situations in which cases are assigned to conditions (e.g., low-cost participation) that are either present or absent. However, to allow for different degrees of membership in a set, we have employed fuzzy-set theory. Therefore, cases in our study could be assigned fully within a set (fuzzy value = 1), fully outside a set (fuzzy value = 0) or considered neither inside nor outside a set (fuzzy value = 0.5). Fuzzy values were then minimised, using Boolean algebra to generate a solution formula displaying all possible paths sufficient for inclusion in FOs (Schneider and Wagemann, 2012).We performed cross-case analysis, using the QCApro Package in the 'R' computer software.

Various reasons make fsQCA appropriate for studying inclusion in FOs. Firstly, being member-owned businesses with multiple objectives, FOs are highly heterogeneous and difficult to compare against each other. Therefore, researchers typically use the individual case study methodology, which has been criticised for lacking systematic comparisons and generalisable results (Shiferaw et al., 2011). To overcome this problem, fsQCA offers tools for systematic cross-case comparison of a small to medium number of cases, as it combines qualitative and quantitative elements, in other words, in-depth case knowledge with mathematical algorithms (Rihoux and Ragin, 2009). Secondly, fsQCA can be used to generate new theoretical arguments (Berg-Schlosser and De Meur, 2009; Marx et al., 2014), which would contribute to the rather scarce literature of inclusion in FOs. Finally, because it allows for complex causality, fsQCA performs particularly well in studying complex phenomena in the social sciences (Rihoux and Ragin, 2009), such as the process-oriented and highly contextualised concept of inclusion (see section 5.2.1).

5.3.2 Data and case selection

We used original data collected between October and December 2015 from FOs in Solwezi, an administrative district of the North-Western Province of Zambia. The study area was chosen for the relatively high importance of maize production there, its relatively low productivity (as a

proxy for fertiliser demand), and its average maize-farm sizes, which are close to the provincial average (Ministry of Agriculture and Central Statistical Office, 2015; Ministry of Agriculture and Livestock, 2015).

We followed Berg-Schlosser and De Meur (2009) sampling approach to QCA, with the objective of seeking to ensure FO comparability while maintaining variability in the outcome and conditions. We set a district-level boundary for the study area to control comparability, as then the FOs would be likely to share ethnic identities, livelihood characteristics, access to markets and have similar quality natural resources and public extension services.

Because fsQCA only performs well under variability of outcomes and conditions, cases were selected purposely, based on prior case information and knowledge from in-depth interviews with government officials and local experts. We identified 15 cases that exhibited acceptable degrees of variability, meaning that they had very low or high levels of inclusion or dissimilar conditions.

We conducted semi-structured interviews to collect information about FOs and member characteristics, inclusion and conditions. Open questions were used to induce story-telling and unexpected answers. In the town of Solwezi, 35 interviews were conducted with representatives of the organisations, individual members and local experts to cross-validate case information. In addition, we conducted three focus-group discussions in local communities, with the support of translators. Case information was supplemented with organisational documents, including bylaws, minutes of meetings or cooperative inspection checklists. We also used quantitative data from the 2014 Solwezi district's Cooperative Register (Ministry of Agriculture and Livestock, 2014b) and the Fifth National Census of Population and Housing (Central Statistical Office, 2013) to define anchor points during calibration.

5.3.3 Operationalisation of the inclusion framework

We relied on case knowledge and discussions with local FO-experts to operationalise our inclusion framework within the context of Zambian FOs. Table 19 provides an overview of the outcomes, conditions, sub-conditions, indicators and anchor points used for cross-case analysis.

Table 20: Operationalisation of the outcome (inclusion) and conditions for farmer organisations in Solwezi, Zambia

Outcome		Indicator	Anchor points
Inclusion (INC)		Share of widows amongst female members is […] than the average in rural Solwezi.	1 = higher 0.5 = equal 0 = lower
Condition	**Sub condition**	**Indicator**	**Anchor points**
Low-cost participation (LCO)	Entry cost	Registration fee is […] than the cost of a share.	1 = lower 0.5 = equal 0 = higher
	Annual cost	Price of a single share is […] than the average price in Solwezi.	1 = lower 0.5 = equal 0 = higher
	Enforcement	FO does not strictly enforce the buying of shares.	1 = yes 0 = no
Pro-poor access to subsidies (SUB)	Equal access	FISP packs are shared equally amongst all members.	1 = yes 0 = no
	Loan availability	FO offers loan service to cover upfront FISP payments.	1 = yes 0 = no
	Internal eligibility	Participation in FISP does not depend on the buying of shares.	1 = yes 0 = no
Long-term commitment (COM)	Age	FO was registered […] years ago.	1 = >5 0.5 = 2-5 0 = <2
	Diversified activities	FO offers […] activities in addition to providing access to FISP.	1 = 2 or more 0.5 = 1 0 = 0
	Attractiveness	FO grew by an additional […] of membership in 2014.	1 = >10% 0.5 = 4-9.9% 0 = < 4%
Presence of wealthier farmers (WEA)	Wealth distribution	The share of members who have bought commercial fertiliser in 2014 is […] compared to the average in the constituency.	1 = higher 0.5 = equal 0 = less
	Presence larger farmers	Membership includes farmers who cultivate 5 or more hectares.	1 = yes 0 = no
	Absence smaller farmers	The share of farmers cultivating 0.5 hectares or less is […] than the average in the constituency.	1 = lower 0.5 = equal 0 = higher

Source: own compilation

5.3.3.1 Inclusion measure

We measured inclusion (INC) against the membership of disadvantaged households in FOs. Based on discussions with government representatives and members of the selected FOs, we

identified widow-headed households as the most disadvantaged ones in rural Solwezi (Kabeer, 2000).[24] Zambia continues to be strongly affected by HIV/AIDS, having the seventh-highest prevalence rate in the world. This, in combination with an average fertility rate of 6.6 children per woman creates conditions of high vulnerability for widow-headed households (Harasty et al., 2015). Women who lose their husbands need to grow enough maize to feed their children, despite limited labour availability.

Beside the share of widows, we initially considered three additional measures for inclusion. Consequently, we collected information on members' participation in decision-making processes, benefits for non-members and community development activities, but some of the information presented contradictions that could not be resolved in the field or through data triangulation. For example, many representatives claimed their FO gave a voice to disadvantaged farmers while its written documents revealed low participation rates at annual meetings. Further, members stated that they were not interested in participating in decision-making processes, especially if their FO provided only FISP support and no additional services. Meanwhile, some measures did not qualify for cross-case comparison. For example, around half of the FOs were involved in community development, but these activities were highly heterogeneous and did not seem comparable (e.g., comparing the building of a community hall against awareness-raising activities for HIV/AIDS or a one-time distribution of soap to orphans in the community).

5.3.3.2 Conditions

We assume that four explanatory factors may shape inclusion or, in other words, incentives for and barriers to FO participation. For analytical purposes, we transformed these factors into conditions, sub conditions and indicators (see Table 19).

Firstly, to enhance inclusion of disadvantaged households, FOs may offer low-cost participation (LCO), which we measured as a composite of different costs. We expected, for example, that initial registration fees might act as an entry deterrent, while annual share costs could become an obstacle to membership continuity.

[24] We also considered the elderly as a disadvantaged group of farmers, as their physical capacity limits their performance of agricultural activities but decided not to use them as a measure of inclusion, as they tend to receive more support from their extended families than widows do. Consequently, the vulnerability of older people had to be considered case by case while their individual household situations were difficult for interview partners to evaluate.

Secondly, FOs can offer pro-poor access to subsidies (SUB) to increase incentives for disadvantaged households. Because all FOs studied were involved in FISP, we expected that gaining access to subsidised inputs would generally be the main motive for membership. We found that some organisations develop internal arrangements to redistribute the limited amount of subsidised inputs in a pro-poor way so that all members can somehow benefit. In contrast, others distribute subsidies on a first come, first served basis. Some organisations also offer loans to members who otherwise cannot afford FISP packs. Then again, access to benefits may be obstructed if an organisation sets up internal rules to limit participation in FISP by, for example, making annual buying of shares a pre-condition.

Thirdly, we included each FO's long-term commitment (COM) in our analysis, representing the benefits that FOs may offer beyond FISP provision. Although smallholder farming households continue to face various challenges in rural Zambia, many FOs choose not to offer additional services. But this overdependence on FISP make them less sustainable in the long-term, meaning that, if FISP were to end, such organisation would quickly collapse. In contrast, FOs with a diversified portfolio of activities demonstrate greater long-term commitment by generating additional member benefits. Another indication of FO commitment is the number of new members that it attracts. We found that FO services (e.g., processing, marketing or collective farming activities) generally require substantial investment, and FOs raise their main capital through member contributions, which means that committed FOs are likely to have open membership. Also, because farmers weigh expected benefits and costs against each in their membership decisions, we assume that new members are less likely to invest in FOs that are dormant, less active and do not seem to create any extra, tangible benefits. Lastly, long-term commitment is likely to be time-sensitive, meaning that, even if organisations decide to offer additional services, it will take time before benefits are realised. In this vein, we expect that younger FOs may be mainly preoccupied with establishing and improving the functioning of their own structure before they can offer additional economic or social benefits.

Finally, the presence of wealthier farmers (WEA) was expected to shape inclusion, but the literature as well as local experts remain equally inconclusive about its effects. We expected that, on the one hand, wealthier farmers could assume leadership positions and professionalise their organisations, which would likely increase profitability and working capital. On the other hand, the presence of wealthier farmers bears the risk of elite capture and the crowding-out of disadvantaged households who do not feel their needs represented. Dominance of wealthier

farmers over others is not only visible in their presence but also in the absence of very small farmers, indicating crowding-out effects. We therefore included both measures in the analysis.

5.3.3.3 Calibration process

We applied a direct calibration method at outcome and condition levels (Ragin, 2000), which required setting three anchor points indicating how strongly a case was associated with a condition or the outcome. According to our calibration logic, if a condition is present in a case, then it receives a fuzzy value of 1, indicating that it is fully within the set. If the condition is not present in a case, then it receives a fuzzy value of 0, indicating that the case is fully out of the set. Meanwhile, a fuzzy value of 0.5 functions as a crossover point, where the condition is neither present nor absent.

Anchor points were generated from statistics, case knowledge and natural breaks in the data; meanwhile, we used census data to establish external reference points for continuous indicators. In the calibration process at the outcome level, we considered a case fully within the set of inclusive FOs if its female members were 15% widows. Analogously, we applied a crossover point at 10% and fully out value at 3%.[25]

We also calibrated the four conditions, each comprised of three sub conditions with corresponding indicators, as listed in Table 19. To obtain a single condition value, we aggregated the three indicators arithmetically, generating each condition value as the average of the indicators, which can be either present or absent (1 or 0, respectively) or higher (1), equal (0.5) or lower (0) than the average value in the constituency. Using the condition values, we applied a fully in value at 0.65 (generally cases exhibiting two out of the three indicators), crossover value at 0.34 (cases generally exhibiting one indicator) and fully out value at 0.01 (cases with no indicator).

5.4 Results from fsQCA

5.4.1 Necessity analysis

We first analysed our data to identify necessary conditions and combinations of conditions. In set theory, a condition is necessary if, whenever the outcome is present, the condition is present

[25] We used the average share of widows among rural women in Solwezi as a reference point to set anchor points. In 2010, 8.18% of the 36,935 women in the rural area of the district were registered as widow (Central Statistical Office, 2013).

too. This means that the condition is a superset of the outcome. Following (Schneider, 2019), we applied high consistency (0.9), coverage (0.6) and 'relevance of necessity' (0.5) thresholds to assess necessity and empirical relevance of necessary conditions.

Table 20 reveals that only the presence of long-term commitment (COM) fulfils these criteria and qualifies as a necessary and not irrelevant condition for inclusion.[26] This implies that inclusion can only be observed in FOs that show long-term commitment to their members. However, a necessary condition is not a guarantee for a positive outcome. There could be instances where COM is present but the outcome (INC) is not, suggesting that COM may not be sufficient to explain the outcome. Instead, other conditions and their combinations with COM are needed to sufficiently explain inclusion in FOs.

Table 21: Necessity analysis for inclusion in Zambian farmer organisations

	LCO	SUB	COM	WEA
Consistency	0.77	0.74	0.95	0.72
Coverage	0.58	0.66	0.73	0.62
Relevance of necessity			0.50	

Note: Ranging from 0 to 1, consistency indicates the degree in which instances of the outcome agree in also showing the condition, while coverage indicates the degree in which the instances of the condition overlap with instances of the outcome (Ragin, 2006). Coverage and the 'relevance of necessity' describe empirical relevance.
Source: own calculations

5.4.2 Sufficiency analysis

To perform sufficiency analysis, we first generated a truth table for the outcome (INC) and the four conditions. Table 21 shows that 8 of the 16 possible combinations of conditions are empirically observable in the dataset, with 7 cases having the outcome present. The unobserved combinations were treated as logical remainders.

[26] To decide whether a necessary condition is also meaningful, its empirical relevance has to be assessed (Goertz, 2006; Ragin, 2000; Schneider, 2018; Schneider and Wagemann, 2012; Ragin, 2006). The coverage and 'relevance of necessity' (RoN) indicator inform about the trivialness (the condition set is much bigger than the outcome set) and the irrelevance (the condition is close to a constant) of a necessary condition. Despite meeting the minimum threshold, the condition of long-term commitment scores relatively low on the RoN-indicator, making it difficult to claim it fully relevant as a necessary condition. Looking at the possibility of COM being a constant, our truth table (see Table 21) reveals that the condition is present in almost all the cases (12 out of 15). A possible explanation for this result may relate to our case selection where we relied on government officials to identify potential FOs. We suspect that officials may have subconsciously pointed us to FOs that were better known to them, possibly because they have shown stronger commitment in the past. Given the relatively low RoN-score, more cases would be needed to decide whether long-term commitment qualifies as a fully relevant necessary condition.

Table 22: Truth table for inclusion in Zambian farmer organisations

LCO	SUB	COM	WEA	INC	Consistency	Cases
0	0	1	1	1	0.90	13
0	0	1	0	1	0.86	2, 3, 6
1	0	1	1	1	0.83	1, 14
1	1	1	0	1	0.82	11
1	1	1	1	0	0.72	4, 8, 9
1	0	1	0	0	0.70	7, 15
1	0	0	1	0	0.65	10
1	1	0	1	0	0.53	5, 12

Note: 0 = Absence; 1 = Presence

Source: own calculations

We then applied Boolean algebra to minimise the truth table and to identify sufficient conditions and combinations of conditions. A condition is considered sufficient if the outcome always occurs when the condition is present. Therefore, sufficient conditions and combinations are subsets of the outcome.[27] Table 22 presents the results of our sufficiency analysis.

Table 23: Results on inclusion pathways in Zambian farmer organisations

Inclusion paths	~LCO	~WEA*SUB	WEA*~SUB*COM
Consistency	0.91	0.82	0.84
Raw coverage	0.27	0.37	0.36
Unique coverage	0.03	0.17	0.08
Case No.	2, 3, 6, 13*	11	1, 13*,14
Solution consistency	0.88		
Solution coverage	0.57		

Note: * Case No. 13 is a multiply covered case

Source: own calculations

Following Schneider and Wagemann (2012), we applied a consistency threshold of 0.8, which renders the following parsimonious solution, where '+' signifies OR, '*' signifies AND, and '~' signifies the absence of a condition:[28]

$$\sim LCO + \sim WEA*SUB + WEA*\sim SUB*COM \rightarrow INC$$

[27] We performed a separate analysis on the absence of inclusion. We applied a consistency threshold of 0.8 and obtained the following parsimonious solution ~COM → ~INC, suggesting that the absence of commitment is sufficient for non-inclusion (solution consistency: 0.84, solution coverage: 0.44). This result is in line with our expectations as the opposite situation of a necessary condition is often found to be sufficient for explaining the negated outcome (Schneider and Wagemann, 2007).

[28] Three types of solutions exist, depending on how logical remainders are treated. According to Baumgartner (2015), parsimonious solutions reflect causal structures better than the conservative and intermediate solutions.

This solution identifies three inclusion paths that can individually and sufficiently explain inclusion in FOs:

1) Absence of low-cost participation leads to inclusion (observed in four cases); OR
2) Absence of wealthy members in combination with presence of pro-poor access to subsidies leads to inclusion (observed in one case); OR
3) Presence of wealthy members in combination with absence of pro-poor access to subsidies and presence of long-term commitment leads to inclusion (observed in three cases).

Our results proved to be robust to changes in the calibration strategy and consistency thresholds. Since the measures of fit and solutions (Wagemann and Schneider, 2015) remained substantively unaltered or in a subset relation with the original solution, we consider our results robust against different analytical choices. We provide the results from our alternative analyses in Table 23.

Table 24: Results from sensitivity analyses

Analysis	**Inclusion path → INC**			**Consistency**	**Coverage**
Baseline	**1 ~LCO**	**2 ~WEA*SUB**	**3 WEA*~SUB*COM**	**0.87**	**0.57**
Calibration thresholds moved downwards [(a)]	●	●		0.88	0.43
Calibration thresholds moved upwards	●	●	●	0.87	0.63
Consistency threshold reduced to 0.75	●	●	●	0.87	0.57
Consistency threshold increased to 0.85	●			0.91	0.27

Notes: ● Path detected

● Part of path detected

(a) We altered the calibration points at the condition level by moving crossover and fully-in thresholds by 0.05 points downwards (0.01, 0.29, 0.6) and upwards (0.01, 0.39, 0.7).

Source: own calculations

5.5 Results from within-case analysis

The results from cross-case analysis only reveal patterns of associations which by themselves do not necessarily entail causation. We therefore present results from our within-case analysis to shed light on the underlying causal processes behind each inclusion pattern.

5.5.1 Role of participation costs

The majority of FOs in rural Solwezi operate at low cost and generally do not offer services beyond access to FISP benefits. Because members do not expect additional benefits, the FOs tend to set very low participation costs or disregard them altogether, echoing the impression of local experts that

> running a business per se is not the primary objective of the farmer organisations […]. People do not put much attention on the meaning of the shares as long as they can access the inputs. (National Government Official, Lusaka)

Nevertheless, we have identified four cases suggesting that higher participation costs may actually lead to inclusion of disadvantaged farmers. Our within-case information reveals that higher participation costs typically stem from the need to raise capital for various forms of investment. To exemplify, FO#6 has decided in its annual general meeting to procure a peanut-butter processing machine, to offer processing services to members for free and to non-members at a fee. To raise sufficient funds for their project, members have therefore agreed to double the price of a single share and make annual buying of shares obligatory.

Our case information suggests that these four organisations use their additional funds to offer financial services assisting vulnerable members in paying their membership fees. In FO#3, members can pay participation fees in instalments, while FO#2, FO#6 and FO#13 allow for payment in-kind via loans. In this manner, these FOs successfully address barriers facing disadvantaged households.

In addition, we have found that these FOs reserve parts of their capital to offer social services that help members in need. In FO#3, such funds are used ‘to assist the more vulnerable members of the group to buy their fertiliser and inputs in order to add to whatever little they might have’ (Chairman), while FO#2 also uses additional funds to offer funeral grants to widowed members.

Overall, we find that FOs with higher participation costs may use the available capital from member contributions to offer mainly financial services to vulnerable members. In this way, such FOs may attract proportionally more widowed members as compared to average FOs with no capital at their disposal.

5.5.2 Role of wealthy members and pro-poor access to subsidies

The second inclusion path suggests that absence of wealthy members in combination with pro-poor distribution of subsidies may lead to inclusion. This pattern can be observed in one case.

Initially, FO#11 was formed with the objective to

> help church members to raise funds/foodstuffs to maintain themselves and to enable the church […] to support […] vulnerable children, the aged, the sick orphans and widows of (HIV/AIDS) deceased parents. (Minutes of meeting, FO#11, 2007)

Although this objective implies that group benefits may be redistributed through the church, interview partners claimed that their FO operates independently.

This objective makes FO#11 stand out against the majority of FOs, which were founded because 'government has announced the FISP. All in all, this means that some external force was driving them. The decision to form the organisation was not internally driven by them' (Provincial Government Official, Solwezi). In contrast, FO#11 has formulated a clear mission, setting out to help members and non-members in the community, which is still visible today:

> It is good if there can be many in the FO. People in the area are not civil servants, they get into agriculture. If they are not members, they are forced to steal crops from others. (Chairman, FO#11)

The FO is highly committed to its objective and, therefore, only accepts members sharing its views. According to the chairman, this has attracted 'small-scale farmers that are alike and that feel unity', whereas wealthier farmers are less interested in joining. Consequently, we assume that absence of wealthier members has contributed to a more homogenous group, meaning that members share livelihood strategies, objectives and may be open towards helping more disadvantaged households, who they feel close to.

In practice, FO#11 has made considerable efforts towards reducing participation barriers. On the one hand, the organisation actively invites non-members to sit in group meetings so that they can make informed decisions regarding possible membership. On the other hand, facilitating pro-poor access to benefits, the organisation offers a loan service to members who cannot pay their FISP contributions. Such members 'usually pay back in money but they can also do it in kind' (Chairman, FO#11).

Additionally, the FO distributes input-pack allotments in favour of vulnerable members. Because there are not enough provided input packs for each member, they have agreed to share them accordingly. Although this is common practice in other Solwezi FOs, FO#11 considers member vulnerability in its distribution scheme. In practice, widows and the elderly pay the same normal-member price for FISP inputs but typically receive twice the amount of subsidised inputs as the average member.

Overall, we find that FO#11 has made considerable efforts towards reducing barriers facing members and non-members and has increased incentives for favourable pro-poor distribution of subsidies, which is likely to have attracted more widows to the group.

5.5.3 Role of wealthy members, non-poor subsidy allocation and long-term commitment

The third inclusion path can be observed in three organisations, where our case information suggests that the presence of wealthier farmers coincides with restricted access to subsidies that is least favourable for poorer members. The combination of both conditions suggests some form of elite capture.

For example, FO#14 redistributed its inputs packs on a first come, first served basis, with FO leaders agreeing on a date by which members should have paid their FISP contributions. The announcement was made on short notice, so the financially constrained farmers failed to pay in time and, consequently, did not receive input packs. This seems a clear case of 'wealthy and powerful members tak[ing] advantage because they are in control. This happens because the members entrust them with the daily decision[s] of the operations' (Provincial Government Official, Solwezi). This result is certainly not encouraging from an inclusion perspective, so a remaining question is why such FOs have nonetheless attracted widows to join them. In this regard, the fsQCA results suggest that inclusion only appears in combination with the third

element of long-term commitment in the solution. Therefore, looking at the combined effects of all the three elements may shed light on the inclusion mechanism here.

One possible explanation may lie in the types of additional benefits that such FOs offer. In fact, the three cases considered for this path do offer social and economic services that respond particularly to the needs of women, including widows. To exemplify, FO#14 operates an open market on a weekly basis where farmers from around the community sell their produce to consumers and traders. Members use the infrastructure for free, whereas non-members pay a fee for their stand and storage facilities. While this service is open to all members, interview partners stated that female members use it more often. We find similar effects in FO#1, offering peanut-butter processing and adult education; in FO#13, engaging in poultry production; and again in FO#14, which also operates a grocery shop. These types of activities clearly require more sophisticated skills, as compared to the average FO activity of solely organising members for FISP distribution. Although leadership seems to matter, FOs in rural Solwezi have been challenged to

> find suitable managers […]. You will find that many members don't know how to read or write […]. And even if you find someone good […], you will find that the farmer organisation cannot offer very attractive incomes. You will find that a skilled person would only work for the purpose of charity or voluntary help. (Provincial Government Official, Solwezi)

Against this background, we expect that wealthier members contribute their skills and knowledge to support FO management. In doing so, they compensate disadvantaged members who have not gotten subsidised inputs with alternative benefits that still meet their needs.

5.6 Discussion and conclusions

This paper has investigated mechanisms regulating inclusion – defined here as modifying barriers to and incentives for access to development opportunities – of disadvantaged households in farmer organisations (FOs). Using primary data from 15 Zambian FOs involved in implementation of the country's Farmer Input Support Programme, we have identified widow-headed households as the most disadvantaged group of farmers in Zambian FOs. Our results from fuzzy-set Qualitative Comparative Analysis (fsQCA) indicate three alternative paths, which seem to both individually and sufficiently explain the emergence of inclusion. Because results from fsQCA only suggest patterns of association, rather than causation, we have relied on within-case analysis to shed light on the underlying processes involved.

The fsQCA results indicate cost of participation as the only factor exerting an effect on its own, although we also unexpectedly found an inverse association between low-cost participation and inclusion. Consequently, our findings do not seem to support the common argument that higher participation costs may discourage participation of widow-headed households (Burke et al., 2012; Selhausen, 2016). Meanwhile, our within-case analysis results have generated additional insights, suggesting that offering financial services to vulnerable members such as widows may be the missing causal link between higher participation (~LCO) costs and inclusion.

Our fsQCA results also offer a second inclusion pattern associated with the absence of wealthy members (~WEA) in combination with pro-poor distribution of subsidised inputs (SUB). Here, within-case analysis revealed that the particular FO under study redirected its input packs to vulnerable members whom others shared their livelihood strategies with and felt close to, in the absence of wealthy farmers. This implies that this combination of conditions (~WEA*SUB) can be seen as standing for the higher-order construct of shared identities between widows and other members. We therefore assume that shared identity could also be sufficient to explain inclusion on its own, whereas ~WEA and SUB are functional equivalents of the shared identity-construct.

The third inclusion pattern provided by our cross-case analysis revolves around a complex combination of three explanatory factors, pointing to the presence of wealthy members (WEA) in combination with restricted access to subsidies for the poor (~SUB) and presence of long-term commitment (COM) leading to inclusion. At first sight, this pattern could be seen as indicating elite capture (Markelova and Mwangi, 2010), whereas our within-case analysis suggests that providing alterative benefits in order to compensate vulnerable members such as widows for not being able to access subsidised inputs may forge a link between this combination of conditions (WEA*~SUB*COM) and inclusion. Clearly, however, this inclusion process would appear to be less preferable from a development-programme perspective.

Finally, we have identified long-term commitment (COM) as a necessary condition, suggesting that inclusion only develops in committed FOs. However, as we have sought to show, long-term commitment is not sufficient for explaining inclusion, which additionally relies on one of the three inclusion processes described above. Nevertheless, because these processes require a certain amount of financial capital or tangible benefits, we consider commitment a *precondition* for inclusion. To exemplify, long-term commitment is likely to have incentivised FOs to increase their participation costs so as to increase their capital for future investments (first path)

or allowed them to secure enough benefits to compensate vulnerable members and widows for not being able to access subsidised inputs (third path). The role of commitment as a necessary condition can add another perspective to the discussion of trade-offs between equity and business-orientation in FOs (Bernard and Spielman, 2009; Francesconi and Heerink, 2011; Lutz and Tadesse, 2017; World Bank, 2008). Although it has been proposed that FOs can only promote either of these objectives, our results suggest that they are not exclusive and that COM, by offering tangible benefits that go beyond the provision of subsidies, could be considered a prerequisite for achieving equity objectives such as inclusion.

Our results are clearly context-specific but may, nevertheless, offer some important insights regarding inclusion in FOs. First, they indicate multiple ways in which FOs can enhance inclusion, by reducing costs and increasing benefits for particularly disadvantaged households, highlighting the need for FOs to provide targeted interventions to households that otherwise may not find participation rewarding, because their expected costs exceed associated benefits (Bernard and Spielman, 2009; Khan et al., 2015; Shiferaw et al., 2011).

Second, our results may help to explain why some FOs are more inclusive than others, which may be particularly relevant in contexts where FOs are used as development instruments to channel external benefits. In line with previous findings (Bernard and Spielman, 2009; Chirwa et al., 2005; Shiferaw et al., 2011), our results indicate that government and donors should not expect to automatically reach their intended target groups of disadvantaged households simply by involving FOs in their programme implementation. Rather, our results suggest that inclusion develops along multiple mechanisms that can be fostered according to the willingness and ability of FOs to reach out to such target groups.

Finally, our methodological approached has allowed us to underpin and complement the patterns obtained via fsQCA with case-specific information. We leave it to future research to investigate the individual and combined effects of financial services, shared identities and compensation, which we have proposed as additional explanatory factors for inclusion. Important to note, however, is that our highly contextualised operationalisation of the inclusion concept may create the impression that some conditions are incomplete or missing. Consequently, we wish to clarify that some measures and conditions have been dropped during the research process. For some measures, we could not detect enough heterogeneity between cases (e.g., regarding internal rules formulated in FO by-laws, as the majority of them use the same template), whereas others turned out to be generally irrelevant in the Zambian context

(e.g., regarding price effects or collective marketing in FOs, as members sell their maize to the Food Reserve Agency at fixed prices). Our approach has also been subject to certain limitations. Data collection was restricted by the availability of information (e.g., regarding exact farm sizes or wealth groups of members) and the fact that some topics required approaches different than the ones we chose for data collection (e.g., elite capture or adverse power relations within FOs may require observational data or interviews with individual members). In the end, because case selection was purposely restricted, our findings should not be taken as representative of all Zambian FOs but, rather, as a starting point for future research seeking to help make the idea of inclusion a reality for disadvantaged groups.

5.7 References

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6 SUMMARY AND CONCLUSIONS

From both theoretical and empirical perspectives, whether cooperatives provide their members with benefits remains open to debate. Under the present conditions of economic globalisation and modern agricultural markets, which are simultaneously imposing new challenges on cooperatives as well as renewed interest in promoting them as a development tool, better understanding and analysis of cooperative effects in developing contexts is needed. In the work presented in this thesis, I have sought to addresses this knowledge gap by performing a systematic literature review of cooperative effects and member characteristics, and empirical analysis of cooperative effects in two particular domains: prices received by farmers in Argentina and inclusion of disadvantaged farmers in Zambia. The literature review has allowed me to establish in which domains there is greater evidence of positive, negative or non-significant cooperative effects and whether disadvantaged farmers participate in cooperatives. Meanwhile, my empirical research has shed light on two crucial aspects. First, for farmers selling their produce to agricultural cooperatives, prices are very important because agriculture is generally their main income source. Second, for disadvantaged farmers who are struggling to join or remain in a cooperative due to their lack of resources to pool, cooperative inclusion strategies may be a key determinant of their participation. I hold that the findings presented here can contribute towards enhancing our knowledge on cooperative effects on their members in development contexts.

In the following, I first recapitulate and synthesise the key findings and contributions of the thesis and, then, develop policy recommendations based upon them. In closing, I present the limitations of the thesis and identify areas for future research on cooperative effects.

6.1 Key findings and contributions

6.1.1 Paper One: Systematic literature review

Paper One conducts a systematic literature review of cooperative effects on members in developing contexts by identifying and screening potentially relevant articles according to defined inclusion criteria and then performing a critical appraisal of the scientific rigour of the 70 articles selected. As a result, it provides a descriptive analysis of countries and sectors studied, along with identified functions of cooperatives and sources of support. After analysing

member versus non-member characteristics, it analyses the cooperative effects found in articles considered most rigorous.

The review finds that the 70 articles are by large concentrated around a small set of countries and sectors and that cooperatives perform multiple functions, mainly including marketing. Around 64% of articles report external support, including some from multiple organisations. Governments are the main support providers, generally initiating cooperatives and, to a lesser extent, supporting their regular activities.

Regarding differences in member and non-members characteristics, it appears that farmers who are better off – in terms of education, farm size, access to credit and income levels – are more likely to be cooperative members; however, this does not hold for variables such as farm equipment, information and communication technology assets, or access to extension services. Nevertheless, regardless of their membership status, in most cases where analysis has been possible, all studied farmers tend to own less than 1 hectare of land. This means that, even though from a statistical perspective members' farms are relatively larger than those of non-members, from a socio-economic perspective they should all be considered very small or subsistence farmers.

Concerning cooperative effects on their members, the most conclusive evidence corresponds to the categories studied by a meaningful number of articles, exhibiting the largest shares of positive results: access to and use of inputs, income, prices, and women's status and agency. Moreover, there is a group of promising effects, meaning categories studied by few articles but with a large share of positive findings: financial services, profit, social capital and technical efficiency. Regardless of the effect category, since there is a meaningful share of results for which there is not enough evidence of an effect, we conclude that such positive effects are probable but need further confirmation.

6.1.2 Paper Two: Cooperative price effects in the Argentinean non-varietal wine sector

Motivated by contrasting theoretical propositions, Paper Two explores the price effects of processing cooperatives and Investor-Oriented Firms (IOFs) in the Argentinean non-varietal wine sector. It uses a unique data set of 5,042 records of the sale of bulk non-varietal wine during 2007–2012 and runs a multilevel regression model to explain prices according to farmer delivery decisions.

The paper finds that on average cooperatives pay 3.4% lower prices than IOFs. Nevertheless, the price differentials between cooperatives and IOFs in a particular administrative department depends greatly on the strength of the respective cooperatives, measured by their surface, grape and wine share handled in each department. In other words, the size of the identified discount falls as cooperative strength increases. The regression results indicate that, while sufficiently high cooperative strength – the data suggest a dividing line at about 30% – will generally lead to a premium over IOF prices, it does not lead IOFs to pay higher prices. In the department with the highest cooperative strength, the premium reaches 2.4%. Thus, cooperatives effectively only offer a price premium to the growers who sell them their produce, a premium which is not extended to growers selling to IOFs.

I suggest that the general inability of cooperatives to pay a price equal to or greater than that paid by the IOFs can be explained by the market structure for non-varietal wine in Argentina. There is evidence that cooperatives fulfil different functions and serve different producers than their IOF counterparts. In particular, there is some support in the data for the argument that wine cooperatives serve as the market of last resort for many producers. In 10 out of the 11 departments analysed, the vineyard size of cooperative members is considerably smaller than the average size of producers in the department. Related to that, the average volume of a cooperative wine purchase is 25% smaller than the average IOF purchase. Cooperative members are smaller and have older and less-efficient technology, which means they may have fewer options when it comes to marketing their output and hence less ability to access buyers offering higher prices. These structural features can be expected to result in higher costs for the cooperatives, reducing their ability to pay higher prices.

Despite the lower prices paid by Argentinean wine cooperatives, I argue that farmers are still patronising them because they offer some kind of value. Producer selling decisions may be influenced by other factors apart from price, such as other services offered by cooperatives. In the case of Mendoza province, for example, these services might include political representation through the federation of cooperatives, access to extension services and unlimited delivery rights.

6.1.3 Paper Three: Cooperative price effects in the Argentinean dairy-processing sector

Paper Three aims to better understand the role of Argentinean cooperatives during a period of rapid structural change. Since the 1990s, Argentinean dairy-processing cooperatives have lost considerable amounts of members and market share. Their current role is analysed here by investigating the characteristics of farmers who continue delivering to them and price differentials between cooperatives and IOFs. Member and non-member characteristics are analysed with a probit regression model applied to 917 farmers. Then, farm-size differences are further studied with t-tests on data representing 70% of national milk volume. Lastly, price differences are analysed with a hierarchical multilevel regression model applied to 9,720 transactions among farmers and processors and price volatility is analysed with prices' coefficients of variation.

The paper finds that dairy-cooperative members are more disadvantaged than farmers delivering to IOFs in terms of education, farm size and productive technology. Moreover, their daily deliveries to cooperatives are between 11% and 29% smaller than those received by IOFs, depending on province. Regarding prices, the model shows that, after controlling for quantity and quality, on average cooperatives pay (3.5%) lower but more stable prices than IOFs, which may be related to cooperative farmers being smaller than those in IOFs. It could be that this pattern is the result of a "screening for the best producers" process (Crespi et al., 2012). Large dairies need to constantly fill their capacity and compete among each other for "the best" (larger) milk producers, which allows processors to realise economies of scale. The result of this competition is a price premium for larger farmers. Cooperatives, however, seem to be dealing more and more with small farmers to whom they cannot pay a competitive price, probably due to higher costs.

For smaller and more disadvantaged farmers delivering to cooperatives, it seems that the value of the right to deliver entailed by membership and higher price stability outweighs the price disadvantages involved. Consequently, cooperative membership may represent a way of ensuring small farmers against the hardships of changing markets.

6.1.4 Paper Four: Cooperative inclusion mechanisms in the Zambian maize sector

Paper Four conceptualises and operationalises mechanisms that may contribute towards inclusion of disadvantaged households in Zambian cooperatives within the framework of the governmental Farmer Input Support Programme (FISP), which relies on cooperatives to organise farmer access to subsidised inputs. Employing primary data collected in 2015 from 15 cooperatives, a Qualitative Comparative Analysis (QCA) identifies all necessary and/or sufficient conditions and their combinations that can lead to an outcome, in this case, the inclusion of widow-headed households – identified, using case knowledge, as the most disadvantage farmer group. Through cross-case analysis, three patterns of association are revealed, which seem to both individually and sufficiently explain the emergence of inclusion: a) absence of low participation costs, b) absence of wealthy members in combination with presence of pro-poor access to subsidies, c) and presence of wealthy members in combination with absence of pro-poor access to subsidies and presence of long-term commitment.

Meanwhile, within-case analysis sheds light on the causal processes behind each of the three inclusion patterns. First, cooperatives with higher participation costs may use the available capital from member contributions to offer mainly financial services to vulnerable members. In this way, such cooperatives may attract proportionally more widowed members as compared to average cooperatives with no capital at their disposal. Second, the cooperative with absence of wealthy members in combination with presence of pro-poor access to subsidies seems to attract a more homogenous group, meaning that members share livelihood strategies, objectives and may be open towards helping more disadvantaged households, who they feel close to. Third, the presence of wealthier farmers coincides with restricted access to subsidies that is least favourable for poorer members. The combination of both conditions suggests some form of elite capture; nevertheless, the presence of cooperative long-term commitment and case information suggest that these cooperatives offer social and economic services that respond particularly to the needs of women, including widows.

The results are context-specific but offer some important insights regarding inclusion in cooperatives. First, they show that cooperatives can be inclusive. Second, they indicate multiple ways in which cooperatives can enhance inclusion. Therefore, inclusion in cooperatives can hardly be induced by a single factor but, rather, requires a systemic approach in which cooperatives provide targeted interventions to households that otherwise may not find participation rewarding, because their expected costs exceed associated benefits.

6.1.5 Joint contribution: Synthesis of contributions regarding multiple cooperative effects and disadvantaged member characteristics

Analysing the contributions of each paper together here will enable me to address the research questions set out in the introduction. My first question is related to the socio-economic characteristics of farmers who participate in cooperatives. According to the findings discussed above, cooperatives are likely to serve the interests of the most disadvantaged farmers.

In the 17 articles from the literature review (Paper One) where relevant information was given, I see that, regardless of whether they are cooperative members or not, in most cases farmers have less than 1 hectare. Therefore, they can hardly be categorised as anything but very small or subsistence farmers.

Turning to my own empirical research, it can be said to support the general findings of cooperatives working with the most disadvantaged farmers. First, in the Argentinean non-varietal wine and dairy sectors, cooperative members are smaller in farm size than non-members. In addition, in the non-varietal wine sector, due to their small size cooperative members may have difficulties maintaining their own productive infrastructure, while in the dairy sector members are more likely to have lower technological levels. Meanwhile, in 7 out of the 15 Zambian cooperatives I have investigated, the number of widowed female members – considered the most disadvantaged farmers there – was double the average for the rural areas of the studied district.

My second question and its sub questions are related to the specific effects of agricultural cooperatives on their farmer members. The evidence indicates that cooperative effects are multiple and, even though a large proportion of them are positive, there is also a significant share of cases in which there is not enough evidence to satisfactorily prove a particular effect.

On average, each article deemed to be of moderate or high scientific rigour included in the systematic literature review reports 3 effects belonging to different categories. Quantitative articles present 30% of statistically non-significant effects, and 20% of the searched-for effects are not found in the qualitative articles at all. As a possible explanation, I propose that there might be a publication bias against negative effects which, consequently, are rarely reported so as not to scare off funding bodies. Nevertheless, I do not rule out their existence, especially

since my empirical research in Argentina has identified effects that, when individually analysed, can be considered negative.

Related to my sub question regarding price effects, my empirical research on the Argentinean cases shows that cooperatives can provide effects in different directions. In the non-varietal wine sector, cooperatives pay lower prices, but such discounts are reduced as cooperative strength increases. I suggest that, even if cooperatives do not offer prices as high as those offered by IOFs, their presence can nevertheless enhance competition and result in prices higher than what would otherwise be the case. Meanwhile, in the dairy-processing sector, I have observed that cooperatives pay lower but more stable prices than IOFs.

My findings with regard to the relationship between cooperatives and prices challenge the state of the art presented in the systematic literature review, where most evidence points towards positive or non-significant price effects. First, I have shown that cooperative price effects are multiple, as they can include individual prices received by members, price levels for all farmers and/or price volatility. Second, since members continue delivering to cooperatives in the presence of other buyers who would likely pay more, I suggest they derive benefits from cooperatives that compensate for lower prices, such as unlimited delivery rights, which secure a market for their produce and support their survival as farmers. Consequently, I suggest that assessment of cooperative effects should be based on combination of their multiple effects and not on individual ones seen in isolation.

With reference to my sub question regarding cooperative effects on inclusion, according to my literature review, this has not yet been reported on. By showing that Zambian cooperatives can be inclusive, my empirical study sheds light on a field that, to the best of my knowledge, has been little explored, therefore broadening the range of cooperative effects. It is also worth noting that this investigation does not focus on multiple cooperative effects but, rather, on multiple strategies to reach one effect. In this light, it shows how methods other than quantitative, particularly regression analysis, may be more suitable for unpacking complex phenomenon such as inclusion in cooperatives.

Confirming the multiple effects of cooperatives, the literature on both Argentinean sectors shows that cooperatives can have political effects. They are due to FeCoVitA and SanCor, the federation of wine cooperatives and the largest dairy-processing cooperative, respectively, which represent member needs and interests in their respective value chains and policy spheres,

with a resulting improved access to extension services and other public policy benefits, such as in the Zambian case access to subsidised inputs. These political effects were not found in the literature review.

To sum up, I have found that cooperatives are likely to serve the interests of the most disadvantaged farmers; in Argentina, these were relatively smaller farmers, whereas in Zambia they were female widows. Cooperatives can provide their members with multiple effects, which in most cases are positive, but there is also a significant share of cases with lack of sufficient evidence regarding effects. Moreover, negative effects cannot be ruled out. Based on my empirical research, I suggest that, first, cooperatives, as organisations with multiple functions and effects, should be assessed in accord with their complexity and variety, rather than by studying isolated effects. Second, cooperatives should be assessed in the light of the particularities of their farmer members, meaning that their effects may reflect farmer needs or characteristics and not organisational features per se.

6.2 Policy recommendations

From the literature review, I derive the general policy recommendation that there is evidence to be optimistic about cooperatives as appropriate means for rural development but, at the same time, governments and donors should still be cautious. The review highlights the existence of a large share of cooperative positive effects in economic but also social dimensions, reflecting the dual nature of cooperatives as social groups and business enterprises. Nevertheless, the significant share of cases lacking sufficient evidence regarding effects should keep governments and donors cautious about their suitability or efficacy in all cases. Moreover, the fact that cooperatives are less involved than they could be in activities such as access to credit and processing of agricultural produce may indicate a need for other strategies than collective action via cooperatives. Lastly, theoretical claims regarding potential cooperative failure and the fact that cooperatives have actually failed many times suggest that governments and donors should encourage the analysis of negative results, in order to understand what can be improved, instead of promoting cooperatives based upon studies that only display positive and non-significant results without further considerations.

Based upon my empirical research, I have formulated specific recommendations for each country studied. Since the survival of disadvantaged farmers is being compromised by global agricultural markets, the role of cooperatives in providing a market of last resort in the

Argentinean cases and inclusion in public policies in Zambia should be highly relevant for governments fostering rural development. Therefore, the major challenge for those governments and many others is to avoid repeating unsuccessful paths of intervention, misuse and dependency while supporting the development and competitiveness of cooperatives (Shiferaw et al., 2011) – in other words, their survival.

Governments may implement four different types of policy measures (McDonnell and Elmore, 1987). First, *mandates* are the rules governing the actions of individuals and agencies. Second, *inducements* are transfers of money to individuals or agencies in return for production of goods and services. Third, *capacity building* is the transfer of money to individuals or agencies for the purpose of investment in future benefits via material, intellectual, or human resources. Lastly, *system changing* is the transfer of official authority among individuals and agencies.

In both countries analysed, there are mandate measures in place, including the existence of cooperative laws and public organisations devoted to promoting and facilitating the formation and growth of cooperatives. I suggest both countries could benefit from additional mandates and capacity-building measures.

In a context where specific policies for small-scale farmers are scarce or have very limited scope and budgets, Argentinean cooperatives act as a defensive means for small-scale farmers dealing with the hardships of structural changes and their consequences. As a result, cooperatives may have greater additional costs which prevent them from paying competitive prices. Members may compensate for price-differential losses involved through other benefits from cooperatives and, therefore, continue delivering to them. Nevertheless, cooperatives could be supported via tax exemptions, increasing the capacity of cooperatives to pay better prices and, consequently, improving farmer wellbeing. Additionally, more competitive prices paid by cooperatives might then attract larger-scale farmers, helping cooperatives decrease their costs of operation due to handling larger volumes per transaction and reaching more easily economies of scale.

In the Zambian case, the allocation of subsidised inputs to cooperatives does not follow pre-established rules besides allocating each organisation some of them. Hoping for the chance to be allocated at least some subsidised inputs, cooperative members tend to split themselves into smaller cooperatives. Consequently, many cooperatives lack a minimum number of farmers paying their membership fees and have no financial capital to carry out any other activity besides potentially providing access to subsidised inputs. The national government should

consider mandate measures establishing more transparent rules for the access to subsidised inputs related to the number of members to prevent this situation.

In both countries, capacity-building measures should be directed towards improving the business orientation and competitiveness of cooperatives, with special attention to the inclusion of disadvantaged farmers. In the Argentinean cases, since domestic demand for non-varietal wine is decreasing and demand for dairy products is already at very high levels, further opportunities for growth will probably be associated with international markets. Therefore, cooperatives need support that can enable them to insert themselves in those markets or find future niches in national markets, where small-scale farmers can still play a role.

In the Zambian case, 7 out of the 15 cooperatives proved to be inclusive of disadvantaged farmers. Therefore, the government should carefully assess the ability and willingness of cooperatives to reach out to disadvantaged households and, when necessary and appropriate, support cooperatives in reorienting their incentives and removing barriers to participation via training, such as through peer learning from cooperatives with higher inclusion levels. Moreover, the only source of capital for most cooperatives comes from the shares paid by members, which constrains the possibilities of cooperatives for involving in productive activities which could enhance their survival beyond simply providing access to subsidised inputs. Thus, capacity-building measures should also focus on supporting the business orientation of cooperatives by granting them information about access to credit and development projects conducted by donors, together with agricultural-product urban market characteristics and functioning.

Unfortunately, there is no evidence-based best practice regarding the types and levels of support for cooperatives that could help them to improve their performance (Brusselaers et al., 2014; Iliopoulos et al., 2012). Therefore, governments should design their support measures based on their own needs and the premise of no interference in the autonomy of cooperatives.

6.3 Limitations and future research

A general limitation of cooperative-effects studies thus far is that they have been unable to establish the mechanisms through which cooperatives operate (Fałkowski and Ciaian, 2016). They have rarely, if at all, relied on impact-assessment approaches, which present a theory of change regarding how given inputs lead to intended outputs (White and Raitzer, 2017). At best,

such studies have revealed correlations between two variables – cooperative membership and effects on farmers – based on theoretical considerations that may have not been properly assessed or corroborated at the case level. Lacking context-specific conceptual frameworks or in-depth case-study knowledge, causal relationships have consequently remained poorly explained by previous research.

Although most articles from my literature review include some reference to the enabling properties of the components of the conceptual framework I presented in the introduction to explain cooperative effects, they rarely seek to explain using case-specific empirical information how the functions and services provided by cooperatives (inputs) lead to the impacts found (outputs). Consequently, based on the literature review, I have been able to sort categories of effects according to their directions and shares within the evidence found and the number of articles that provide that evidence, but I cannot validly inform future research or policy about the mechanisms causing those effects.

This limitation is also related to the cooperative evaluation or assessment perspectives adopted by the reviewed articles (Apthorpe and Gasper, 1982). Although most of the articles reviewed successfully avoided taking an *essentialist* perspective, which shows a positive commitment to the matter evaluated and a consequent advocacy function, they nevertheless tended to rely on an *instrumentalist* perspective that asks whether effects exist rather than how they are attained. Moreover, a *transcendence* perspective dominates, with researchers employing their own analytical criteria in selecting effect categories, without any reference to the perspectives of the assessed subjects – cooperative members – or their welfare. Although I do not advocate for an *immanence* perspective, which would mean self-evaluation of cooperatives, I do suggest that the diversity of cooperative objectives and functions could be better analysed if researchers were to use a participatory approach (Bergold and Thomas, 2012). Researchers could engage with cooperative members and managers to find out what effects are the most important for them. In addition, they could provide information about how effects are generated that researchers could test, leading to potential elaboration of theories of change.

My own research also has certain limitations resulting from the methods of analysis employed or data-access issues. The vote-counting procedure, used for the literature review, has been primarily criticised for only considering the direction of effects and not their magnitude and failing to take sampling error into account, with effects from smaller samples deviating more

from population effects than those from larger samples. Future research should focus more precisely on particular effects and use more sophisticated methods, such as meta-analysis.

Due to the large volume of data available, the empirical research for the Argentinean cases relied on multilevel regression models that account for data structure: in the non-varietal wine sector, the years and administrative departments of each transaction and, in the dairy-processing sector, the months and years of each transaction. Though interviews with experts were performed to better understand the sectors, I could not carry out interviews with farmers, which might have further corroborated or challenged my analysis. My doctoral studies were performed during a period of high conflict between farmers and the national government in Argentina, due to price stabilisation and restrictive international trade policies, which limited the possibility of performing interviews, since farmers would most probably have refused to be interviewed.

In the Zambian case, my partner interviews were with experts and cooperative managers, which enabled me to understand the inclusion mechanisms of the studied organisations. This approach was not, however, useful for analysing variables such as elite capture, assuming that cooperatives which are less prone to elite capture may be more inclusive of disadvantaged farmers. In such cases, interviews with members from different socio-economic backgrounds and attendance at assemblies would have been needed.

To conclude, in addition to the need for acknowledging and combining different features of the assessment perspectives expressed above, based on my empirical research, I propose here that cooperative effects can only be understood and assessed in light of the particularities of their associated members. Future cooperative theory should consider cooperative effects and farmer attributes simultaneously. In this way, situations that have so far been modelled as being competitive may turn out to actually be segmented markets where cooperatives and IOFs serve quite different actors, providing them with unique services. Within the historical framework of globalisation and the modern agricultural markets, combined with the pressing needs of disadvantaged farmers in the face of drastic change, understanding the multiple functions and unique services provided by cooperatives may lead to a more realistic reconceptualisation and assessment of their potential.

6.4 References

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APPENDICES

Appendix 1: Systematic literature review specificities

Search specificities

Table 1: Specificities and examples of the search algorithms

Search parameter	Specific parameter	Search database				
		Agecon	**British Library**	**Degruyter**	**Jstor**	**Oxford Academics**
Place of search	Only full text			x		
	Only title	x	x		x	
	Only abstract	x	x		x	x
Time frame	from 1997 until 2018	x			x	
Publication type	Articles		x			
	Journals	x			x	
	Journals/Yearbooks			x		
	Research papers	x				x
Language	English	x	x		x	
Country	Developing					
Keywords	All the words (ex.: agricultural AND cooperative)	x		x		x
	Exact words (ex.: "agricultural cooperative")		x		x	
Wildcards	? (a)	x				
	* (b)	x	x			x

Notes: (a) It stands for s or z. If not possible, both alternatives were introduced, e.g.: organisation and organization

(b) It stands for different endings of a word, e.g.: agricultur* implies agriculture and agricultural, among others

Source: own compilation

Table 1: Specificities and examples of the search algorithms (continued)

Search parameter	Specific parameter	Search database				
		Science direct	**Scopus**	**Springer**	**Taylor and Francis**	**Wiley online**
Place of search	Only full text			x	x	
	Only title	x	x			x
	Only abstract	x	x			x
Time frame	from 1997 until 2018	x		x	x	x
Publication type	Articles					
	Journals	x	x	x	x	x
	Journals/Yearbooks					
	Research papers					
Language	English		x	x		
Country	Developing		x		x	
Keywords	All the words (ex.: agricultural AND cooperative)		x	x		x
	Exact words (ex.: "agricultural cooperative")	x	x	x	x	
Wildcards	? (a)	x	x			x
	* (b)				x	x

Notes: (a) It stands for s or z. If not possible, both alternatives were introduced, e.g.: organisation and organization

(b) It stands for different endings of a word, e.g.: agricultur* implies agriculture and agricultural, among others

Source: own compilation

Search algorithm example:

"producer group" in Article Titles OR "producer group" in Abstract AND “effect” in Abstract between years 1997 and 2018.

Critical appraisal

Table 2: Questions and results for quantitative studies (N=52)

Criterion	Question	Answers	
		Yes	No
Reliability	Does the study control for selection bias?	40	12
	Does the study perform post estimation tests?	29	23
Internal validity	Does the study provide information on the cooperative?	39	13
	Does the study spell out hypotheses or suggest a causal mechanism for the findings?	38	14
	Does the study discuss the limitations of the findings?	13	39
External validity	Does the study apply random sampling of cooperatives/villages?	25	27
	Does the study apply random sampling of members and non-members?	41	11
	Is there a discussion of how findings have contributed to knowledge and understanding?	43	9

Source: own compilation based on Heale and Twycross (2015) and Ryan et al. (2013).

Table 3: Scale and overall assessment for quantitative studies

Rigour	Scale	Reliability	Internal validity	External validity	Overall assessment
Low	0	0	0-1	0-1	0-2
Moderate	1	1	2	2	3-4
High	2	2	3	3	5-6

Source: own calculations

Table 4: Questions and results for research using qualitative methods (N=18)

Criterion	Question	Answers	
		Yes	No
Dependability	Does the study use corroborating evidence to cross-validate findings?	10	8
	Does the study describe the processs of field work?	7	11
Credibility	Does the study provide information on the cooperative?	15	3
	Does the study spell out hypotheses or suggest a causal mechanism for their findings?	13	5
	Does the study discuss the limitations of their findings?	3	15
	Does the study indicate the sampling strategy?	10	8
	Are the findings supported by the data?	15	3
	Does the study provide direct quotations regarding the cooperative effects on members and their systems?	10	8

Transferability	Is there a discussion of limitations on drawing wider inference?	3	15
	Is there a discussion of how findings have contributed to knowledge and understanding?	15	3

Source: own compilation based on Hannes et al. (2011) and Spencer et al. (2003)

Table 5: Scale and overall assessment for qualitative studies

Rigour	Scale	Dependability	Credibility	Transferability	Overall assessment
Low	0	0	0-2	0	0-2
Moderate	1	1	3-4	1	3-4
High	2	2	5-6	2	5-6

Source: own design

Classification of effects

Table 6: Overview of effect dimensions, categories and variables

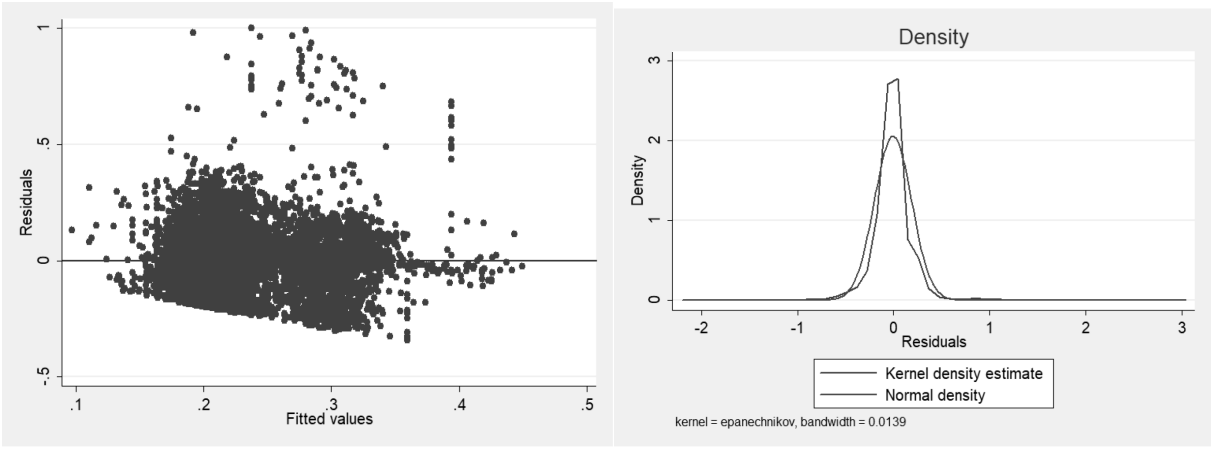
Effect dimension	Effect category	Variables
Environmental effects	Environmental performance	Field management practices Improved natural resource management (soil fertility, soil erosion, water conservation More environmentally friendly inputs (pesticides, organic fertilisers, mulch)
Economic effects on members	Financial services	Access to credit, bank account, insurance
	Income	Gross margin Farm income Gross farm revenue Net income Farm profit Women income Share agricultural income of total income
	Market participation	Commercialised/processed share of produce Quantity commercialised Participation in collective marketing
	Prices	Average price per kg Price per unit
	Wealth	Housing quality Asset holding Subjective household well-being
Economic effects on production systems	Access to and use of inputs	Use of seeds, tissue-culture plantlets, chemical fertilisers, feed, spray pumps, pesticides Value of inputs used Reduced time lag to adopt inputs

	Access to and use of technology	Use of innovative farming techniques Reduced time lag to adopt a practice or technology
	Farm size	Plot/farm size Increase in plot/farm size
	Labour	Family labour used Hired labour used
	Technical efficiency	Technical efficiency
	Yield and quantity	Production volume Productivity and yield
Social effects	Health	Use of protective equipment (face mask)
	Human capital	Skills and knowledge Trainings and access to information
	Food security	Household basic needs Food security
	Social capital	Commitment Membership in other groups or associations Trust Reciprocity Satisfaction
	Women's status and agency	Domestic/farm related work load Decision making power

Source: own compilation

Appendix 2: Residuals

Residuals



Source: own graphic

DECLARATION

I hereby declare that I completed the doctoral thesis independently based on the stated resources and aids.

I have not applied for a doctoral degree elsewhere and do not have a corresponding doctoral degree.

I have not submitted the doctoral thesis, or parts of it, to another academic institution and the thesis has not been accepted or rejected.

I declare that I have acknowledged the Doctoral Degree Regulations which underlie the procedure of the Faculty of Life Sciences of Humboldt-Universität zu Berlin, as amended on 5th March 2015.

Furthermore, I declare that no collaboration with commercial doctoral degree supervisors took place, and that the principles of Humboldt-Universität zu Berlin for ensuring good academic practice were abided by.

Agustina Malvido Pérez Carletti

April 2019